



CUTTING MACHINE

FC2250

FC2250-UM-251-03-9370

SERVICE MANUAL

GRAPHTEC

HISTORY OF REVISIONS

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5				
6				
7				

CONTENTS

1. INTRODUCTION.....	1-1
1.1 Model Names and Basic Specifications	1-1
1.2 Standard Accessories	1-1
1.3 Main Specifications	1-2
1.4 External Dimensions	1-3
1.5 Stand Assembly Procedure	1-6
1.6 Mounting Procedure.....	1-7
1.7 Removing the Y Bar Retaining Brackets	1-8
1.8 Selecting the Vacuum Pump.....	1-9
1.9 Installation Location.....	1-10
2. Description of Parts	2-1
2.1 Plotter Nomenclature	2-1
2.2 Control Panel	2-2
2.3 Types of Cutter Blades and Their Features.....	2-4
2.4 Cutter Pen Nomenclature.....	2-5
3 Basic Operation.....	3-1
3.1 Replacing the Cutter Blade.....	3-1
3.2 Adjusting the Blade Length	3-4
3.3 Mounting the Cutter Pen	3-5
3.4 Adjusting the Pen Carriage Height	3-6
3.5 Turning On the Plotter and Initialization.....	3-7
3.6 Loading the Medium.....	3-8
3.7 PAUSE Menu Configuration.....	3-9
3.8 Setting the Cutting Conditions.....	3-10
3.9 Printing a Conditions List.....	3-12
3.10 Printing a Character Dump List.....	3-14
3.11 Printing the Self-Test Pattern	3-16
4. Daily Maintenance and Storage	4-1
5. RECOMMENDED PARTS LIST	5-1

6. LIST OF TOOLS	6-1
6.1 Tools	6-1
7. DISASSEMBLY AND ADJUSTMENT	7-1
7.1 Adjusting the X-Axis Drive.....	7-1
7.1.1 Removing the X Motor Cover	7-1
7.1.2 Adjusting the X Drive Belt Tension	7-1
7.1.3 Adjusting the Belt Tension of the Front X Slider	7-2
7.1.4 Adjusting the Belt Tension of the Rear X Slider	7-2
7.1.5 Checking the Belt Tension of the Front and Rear X Sliders	7-3
7.2 Adjusting the Y-Axis Drive.....	7-4
7.2.1 Removing the Y Motor Cover	7-4
7.2.2 Removing the Y Motor.....	7-4
7.2.3 Adjusting the Y Drive Belt Tension	7-6
7.3 Adjusting the Y Slider	7-7
7.3.1 Removing the Y Bar.....	7-7
7.3.2 Adjusting the Y Slider Belt Tension	7-8
7.4 Adjusting the Roller Pressure of the Front X Slider.....	7-9
7.5 Adjusting the Roller Pressure of the Rear X Slider	7-10
7.6 Adjusting the Roller Pressure of the Y Slider	7-12
7.7 Adjusting the Position of Sensor Dog Y.....	7-13
7.8 Mounting the Y Slider on the Y Flexible Printed Circuit Cable.....	7-14
7.9 Pen Block	7-16
7.9.1 Removing the Pen Block Cover	7-16
7.9.2 Removing the Pen Block	7-16
7.9.3 Adjusting the Pen Block	7-17
7.10 Using the Mechanical Adjustment Jigs	7-19
7.11 Replacing the Y Bar	7-19
7.11.1 Preparations.....	7-19
7.11.2 Replacing the Y Bar.....	7-20
7.11.3 Checking the Sliding of the Y Bar Frame (Manual Check).....	7-21
7.12 Adjusting the Perpendicularity Precision	7-22
7.12.1 Checking the Deviation in the Perpendicularity	7-22
7.13 Replacing the Electrostatic Adhesion Plate.....	7-24
7.13.1 Peeling Off the Electrostatic Adhesion Plate.....	7-24
7.13.2 Preliminary Preparations for Pasting On New Plate	7-25
7.13.3 Attaching the Electrostatic Adhesion Plate	7-26

8.	ELECTRICAL ADJUSTMENTS.....	8-1
8.1	Flowchart of the Adjustment Sequence	8-1
8.2	Location of the Boards.....	8-2
8.3	Explanation of the Values of the Main Board.....	8-3
8.4	Setting the DIP Switches.....	8-4
8.5	Updating the System Firmware	8-5
8.6	Clearing the Non-Volatile RAM	8-6
8.7	Adjusting the Home Position.....	8-7
8.8	Adjusting the Pen Height.....	8-8
8.9	Adjusting the Pen Force	8-9
8.10	Adjusting the Distance and the Perpendicularity Accuracy.....	8-11
8.11	Adjusting the Pen Interval	8-14
8.12	Adjusting the Auto-Registration Mark Sensor Sensitivity	8-16
8.13	Adjusting the Offset of the Auto-Registration Mark Sensor.....	8-17
8.14	Testing the Control Panel Keys and Home Sensors	8-19
8.15	List of Items Requiring Readjustment.....	8-21
8.16	About Start Up Mode.....	8-21
9	TROUBLESHOOTING.....	9-1
9.1	Troubleshooting Flowcharts.....	9-1
9.1.1	Checking for Faulty Rotation of the Blade.....	9-1
9.1.2	The Cutting Media Cannot be Satisfactorily Cut	9-2
9.1.3	Initialization is Abnormal	9-8
9.1.4	Pen UP/DOWN Operations are Abnormal.....	9-9
9.1.5	The X-axis Backlash is Excessive	9-11
9.1.6	The Y-axis Backlash is Excessive.....	9-12
9.2	The Plotter is Turned On But Doesn't Operate	9-13
9.3	Error Messages.....	9-14
9.4	Error Messages in GP-GL Command Mode	9-15
9.5	Error Messages in HP-GL Emulation Mode.....	9-16
9.6	The Cutting Results are Unsatisfactory	9-18

10. PARTS LISTS	10-1
10.1 Mainframe.....	10-1
10.2 Stand.....	10-3
10.3 Control Panel	10-4
10.4 Control Unit.....	10-5
10.5 X Drive Unit	10-6
10.6 Y Drive Section	10-9
10.7 Standard Accessories	10-12
11. BLOCK DIAGRAMS AND CIRCUIT DIAGRAMS	11-1
11.1 Wiring Connection.....	11-1
11.2 Key Relay Board (PR223281).....	11-2
11.3 Main Relay Board (PN6121-02B)	11-3
11.4 X Relay Board (PN6121-11C)	11-6
11.5 X Flex. Board (PN6121-03C).....	11-7
11.6 X-Y Relay Board (PN6121-04C).....	11-8
11.7 Pen Flex. Board (PN6121-05C)	11-9
11.8 Pen Flex. Board 1 (PN6121-06C)	11-9
11.9 2-Pen Board (PN6121-08C)	11-10
11.10 High Voltage Board (PR31001C).....	11-11
11.11 Main Board (PN6121-01C)	11-12
11.12 Power Relay Board (PN5042-04)	11-21
11.13 Miscellaneous	11-22

1. INTRODUCTION

1.1 Model Names and Basic Specifications

Model	Media hold down method	Cutting area
FC2250-60VC	Vacuum suction	610 (X) x 920 (Y) mm
FC2250-120MG	Magnetic	1200 (X) x 920 (Y) mm
FC2250-120ES	Electrostatic adhesion	
FC2250-120VC	Vacuum suction	
FC2250-180ES	Electrostatic adhesion	1740 (X) x 920 (Y) mm
FC2250-180VC	Vacuum suction	

1.2 Standard Accessories

Item	Description	Q'ty
Power cable		1
Cutter pen set	PPA31-CB15B, CB15U-2SP, CB15U-K30-5SP	1 set
Water based fiber-tip pen	KF552-BK	1
Sheet holder plates	For MG models only (2 large, 2 medium, 4 small)	1 set
Hexagon wrench	For M4 bolts	1
Height adjustment plates	10 mm, 4 mm height	1 of each
Durable flexible hose	For VC models only, 1.5 m to 5 m (can expand/contract) Connection bore diameter: Ø38mm (-60), Ø58mm (-120/180)	1
Hose band	For VC models only, Ø38mm (-60), Ø58mm (-120/180)	2
Vacuum pump installation base	For VC models only	1
USB cable		1
CD-ROM	User's manual, Driver, other software	1

CAUTION

- The vacuum pump is an option. It is not provided with the VC models.
- Make sure that the vacuum pump used with a VC model is affixed with either a label showing compliance with the relevant safety standard or with the CE marking.

1.3 Main Specifications

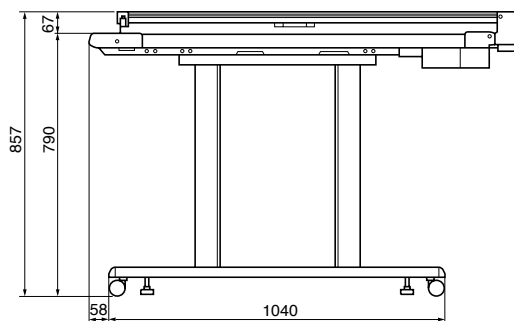
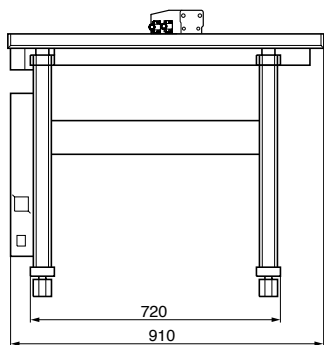
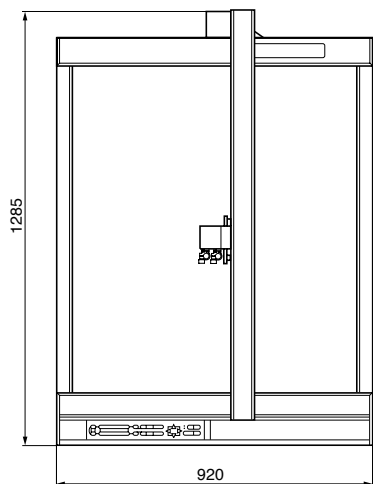
	FC2250-60VC	FC2250-120VC/MG/ES	FC2250-180VC/ES
Configuration	Flatbed		
Effective cutting area	610 x 920 mm	1200 x 920 mm	1740 x 920 mm
Media hold-down method	VC models: Vacuum suction, MG models: Magnetic, ES models: Electrostatic adhesion		
Maximum cutting speed	400 mm/sec (40-step range)		
Cutting force	High force mode: 9.8 N (1 kgf) max : 40-step range 2 to 80 Standard force mode: 4.9 N (500 gf) max : 40-step range 1 to 40		
Minimum character size	About 10 mm square (varies with the character font and cutting media)		
Mechanical resolution	0.0025 mm		
Programmable resolution	GP-GL mode: 0.1/0.05/0.025/0.01 mm, HP-GL™ mode: 0.025 mm		
Distance accuracy	Within 0.1% of the distance moved (plotter mode)		
Perpendicularity	Within 0.5 mm/900 mm (plotter mode)		
Repeatability	Within 0.1 mm (plotter mode)		
Number of pens/cutters	2		
Cutter and pen types	Cutter blades: Supersteel Pens: water-based fibertip, oil-based ballpoint, disposable ink pen*1		
Cutting media	Marking film (vinyl, fluorescent, reflective), Stiff paper/card up to 0.5 mm thick, Sandblast rubber sheets up to 1 mm thick, High-intensity reflective film. Polystyrene foam sheets		
Interfaces	RS-232C, USB 2.0 (full speed); auto-switching		
Buffer memory	2 MB		
Command sets	GP-GL and HP-GL™ emulation		
LCD panel	20 characters x 2 lines		
Reg strat on mark reading function	Provided		
Power supply	100-120 VAC, 50/60 Hz, 1.2 A max 220-240 VAC, 50/60 Hz, 0.7 A max		
Operating environment	10 to 35°C, 35 to 75% RH (non-condensing)		
Guaranteed precision operating environment	16 to +32°C, 35% to 70% RH (non-condensing)		
External dimensions (H x W x D)			
Horizontal	857 x 920 x 1285 mm	944 x 1568 x 1285 mm	944 x 2068 x 1285 mm
Tilted	-----*2	1687 x 1568 x 987 mm	1687 x 2068 x 987 mm
Weight (including stand)	Approx. 58 kg	Approx. 69 kg	Approx. 74 kg
Option	Vacuum pump (Blower) [VC models only]		

*1: Disposable ink pens cannot be used with the high-force pen (Pen 2 holder).

*2: The writing panel on VC models cannot be tilted.

1.4 External Dimensions

FC2250-60VC

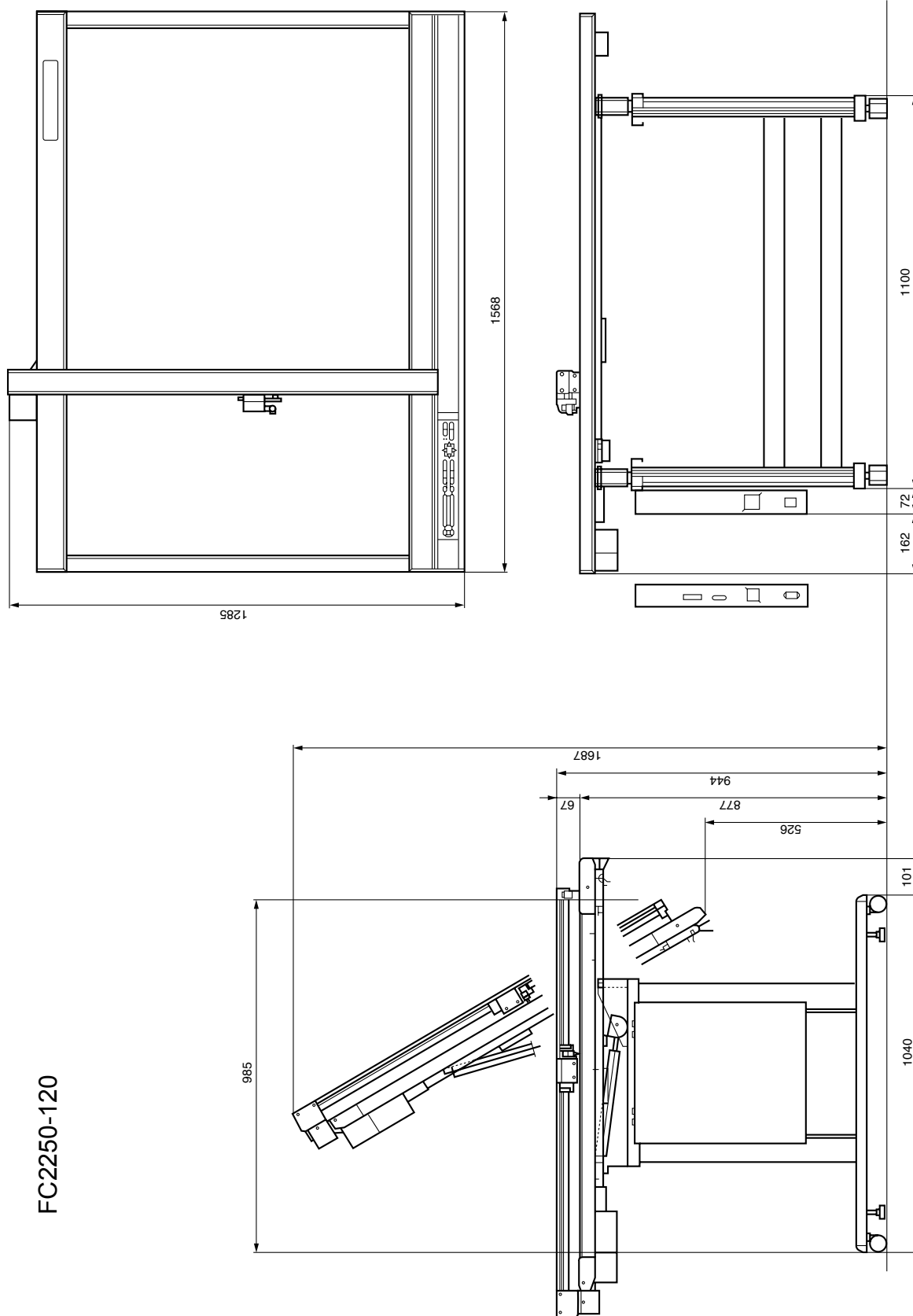


Unit: mm
Dimensional accuracy: ± 5 mm

FC2250-120

Unit: mm

Dimensional accuracy: $\pm 5\text{mm}$

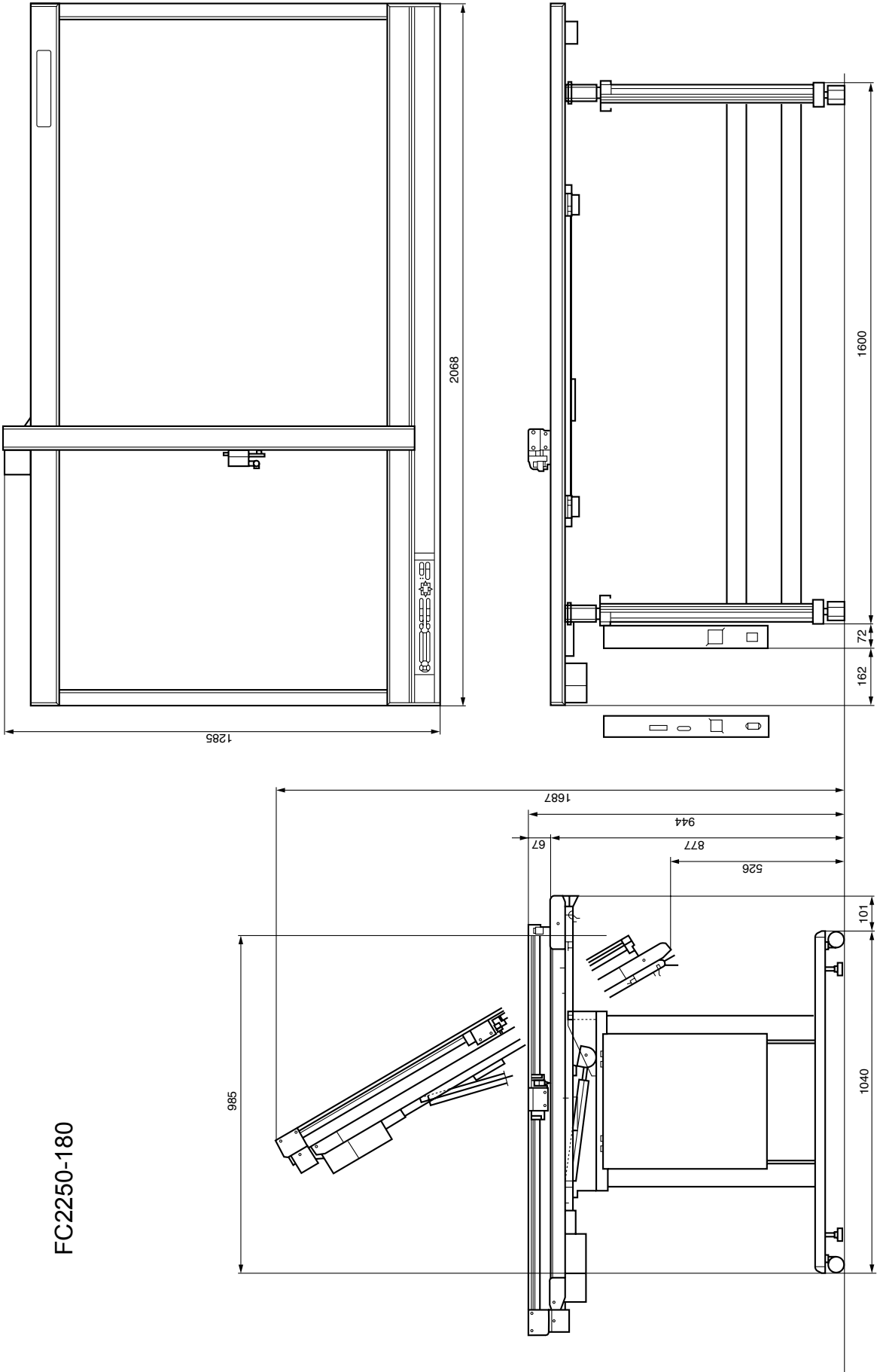


FC2250-120

FC2250-180

Unit: mm

Dimensional accuracy: ±5mm



FC2250-180

1.5 Stand Assembly Procedure

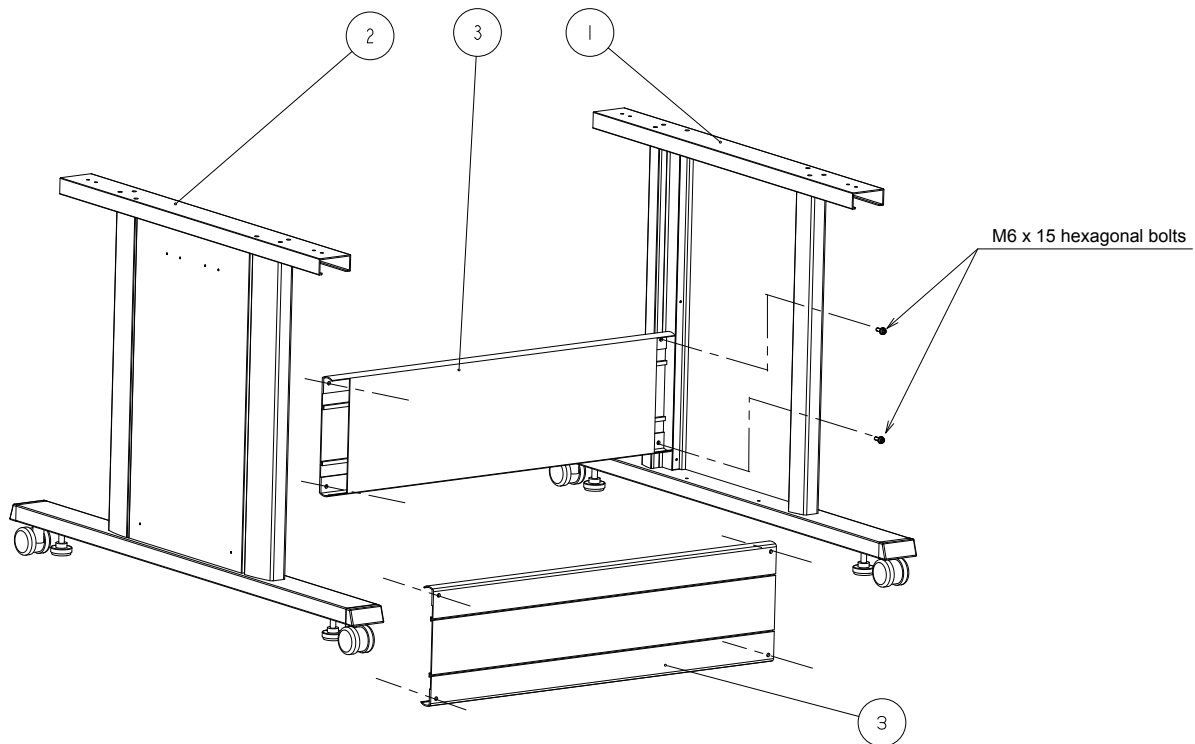
Assembly Procedure

Attach the two center plates (3) to the stand leg (1), using the M6 x 15 bolts and the L wrench provided as standard accessories.

Attach the center plates (3) to stand leg (2) in the same way.

Standard accessories

1. M6 x 15 hexagonal bolts: 8
2. L wrench



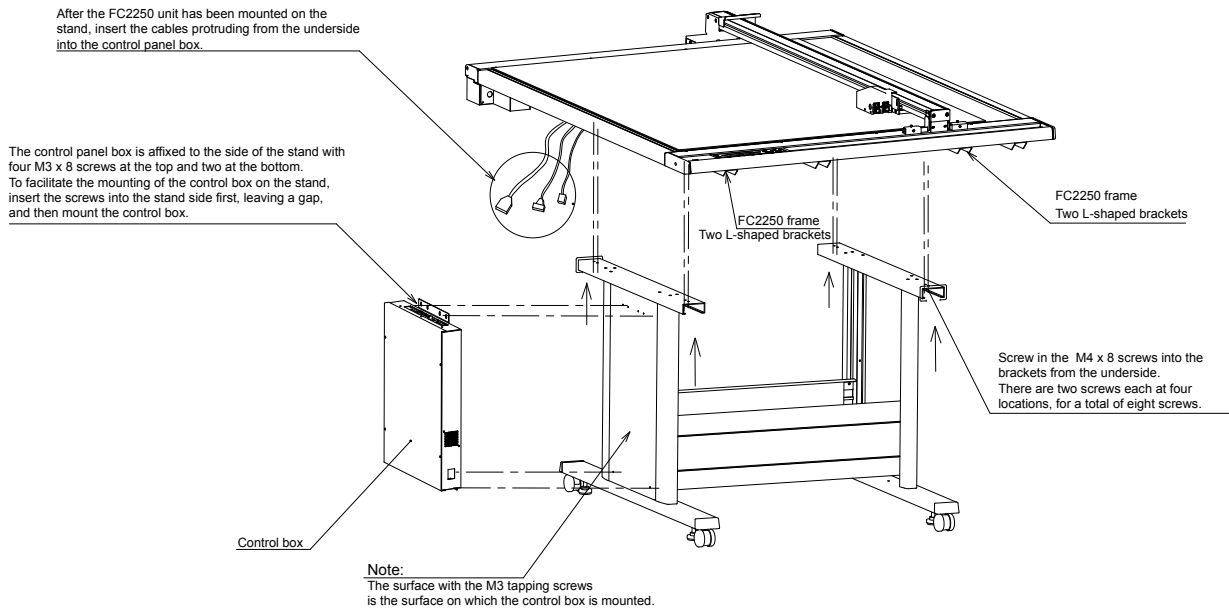
1.6 Mounting Procedure

Screws provided for assembly

1. M4 x 8 bind-head screws: 8
2. M3 x 8 bind-head screws: 6

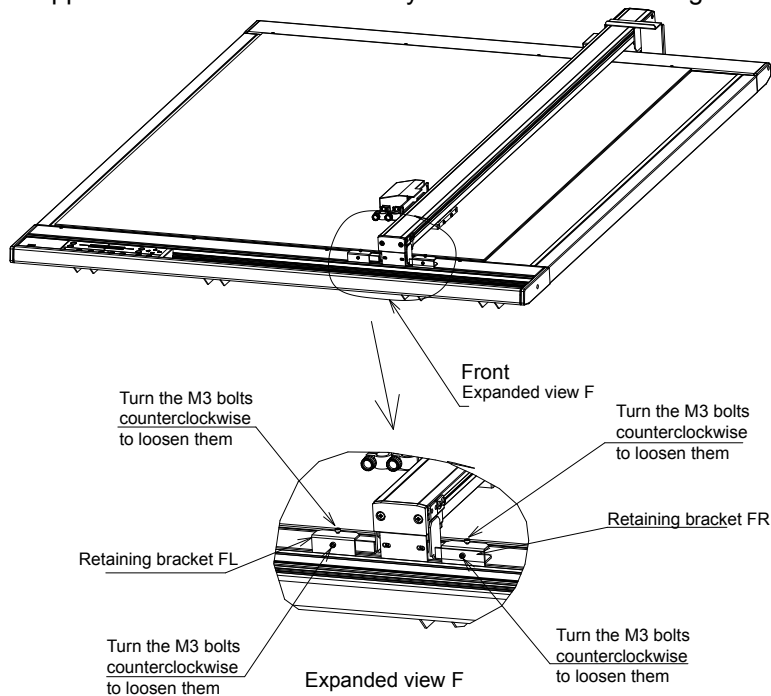
Procedure

- (1) When mounting the FC2250 unit onto the stand, make sure that it is correctly oriented. The three cables protruding from the FC2250 should be at the control box side.
- (2) Position the FC2250 so that the underside of the frame is mounted on top of the stand.

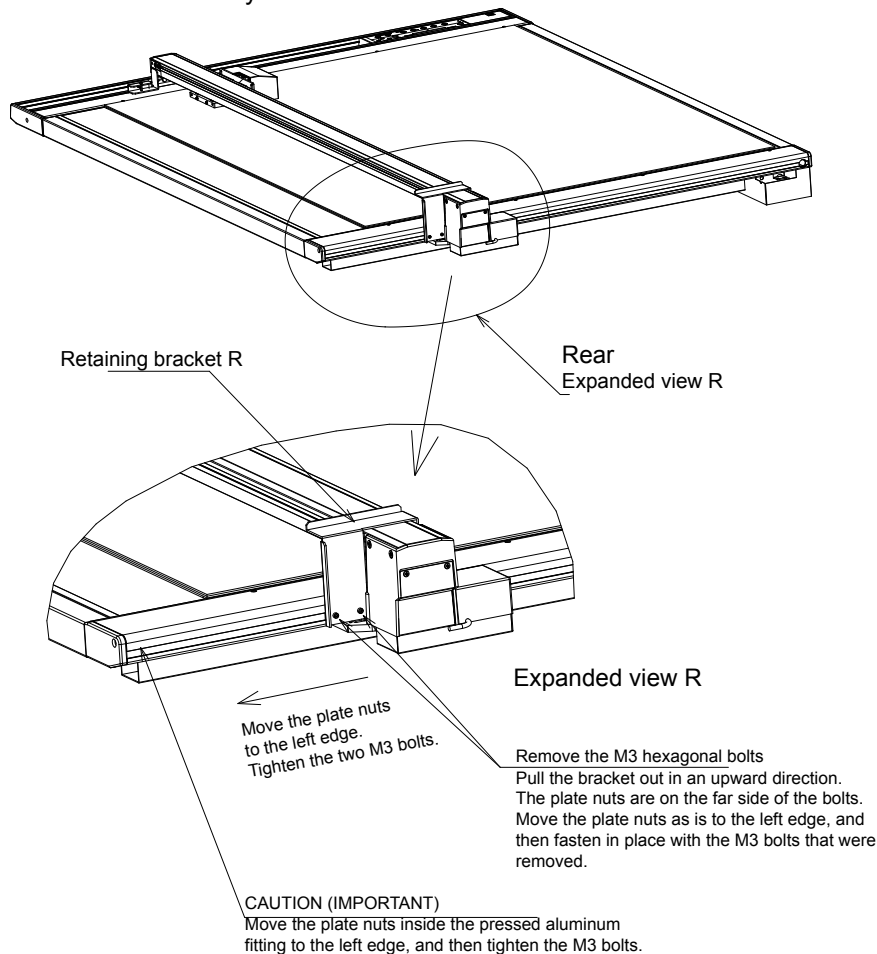


1.7 Removing the Y Bar Retaining Brackets

- (1) Use the L wrench supplied as a standard accessory to loosen the M3 hexagonal bolts.



- (2) Loosen the M3 bolts as shown in the illustration above, and then move the FL and FR retaining brackets to the front, in a horizontal direction. Next, pull the brackets out in an upward direction. Use the L wrench supplied as a standard accessory.



- (3) Loosen the two M3 hexagonal bolts as shown in the above diagram, and then pull bracket R out in an upward direction.

1.8 Selecting the Vacuum Pump

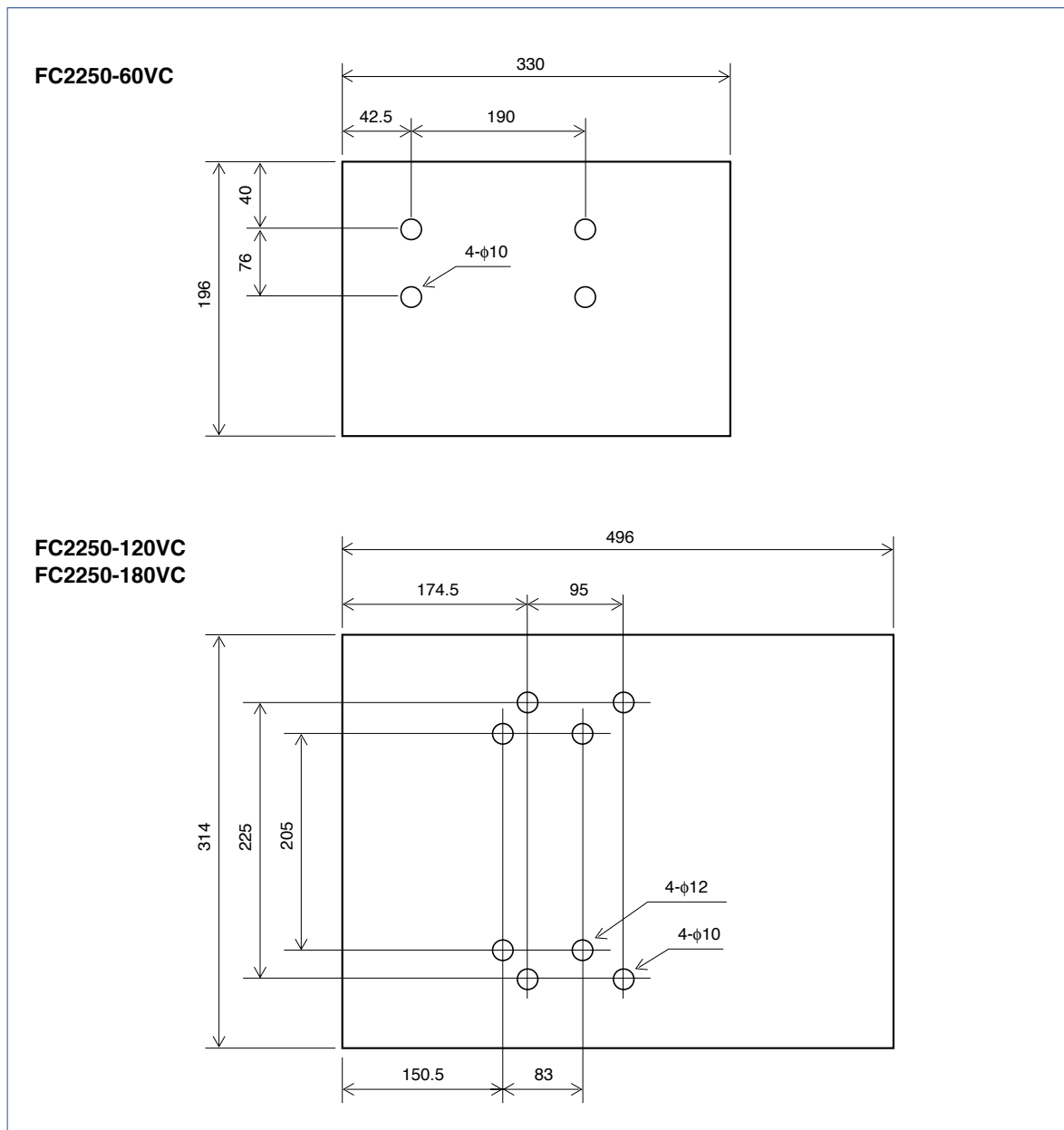
Select the vacuum pump according to the guidelines listed in the table below.

Item		FC2250-60VC	FC2250-120VC	FC2250-180VC
Ratings	Airflow (m ³ /min)	0.3	0.5	0.5
	Static pressure (kPa)	5.4	6.4	6.4
Hose connection bore		38 mm	50 mm	50 mm

CAUTION

Make sure that the vacuum pump used with a VC model is affixed with either a label showing compliance with the relevant safety standard or with the CE marking.

The figure below shows the dimensions of the vacuum pump installation base provided.

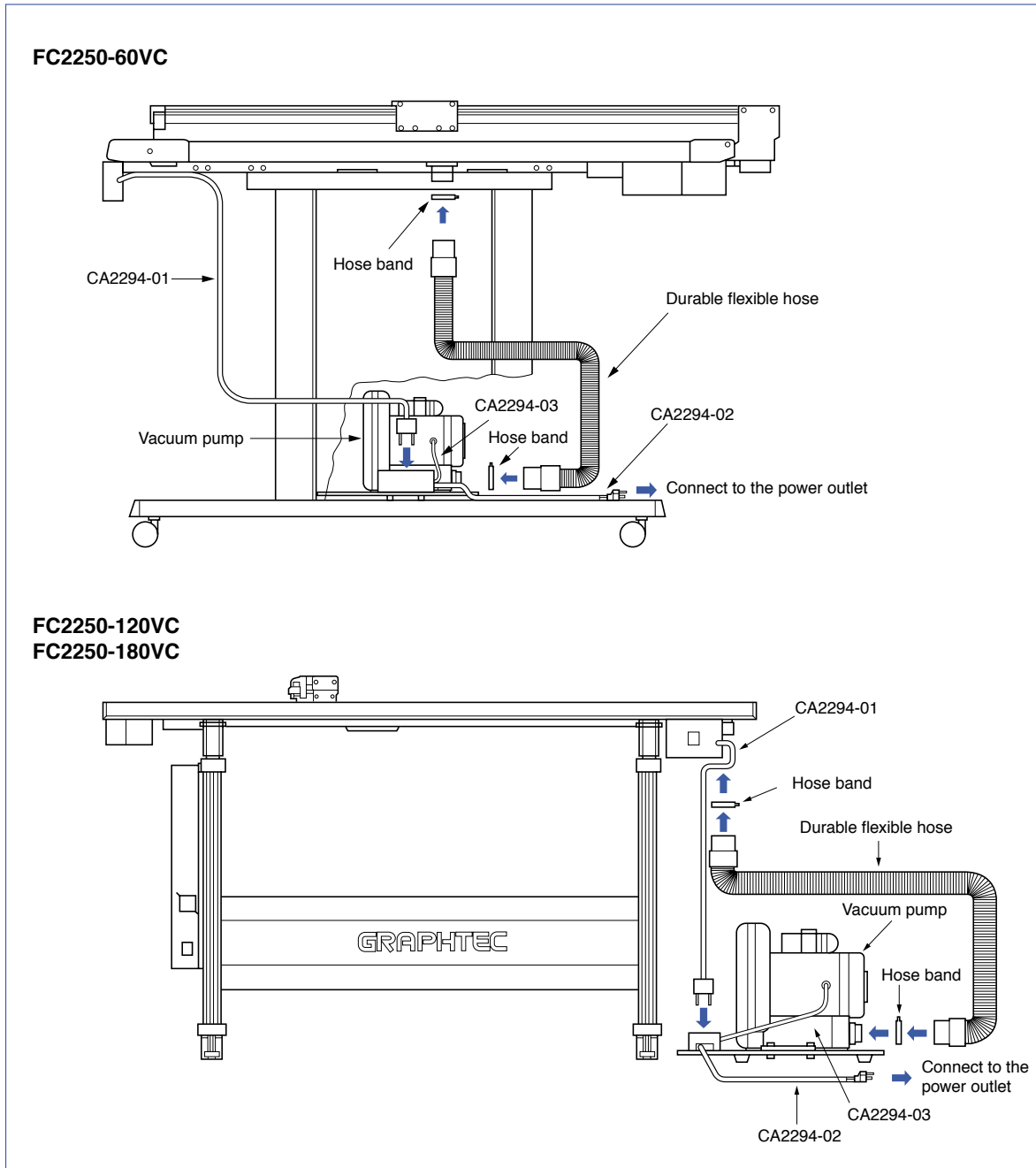


1.9 Installation Location

When connecting the vacuum pump to your cutting plotter, please refer to the following diagram.

CAUTION

The exhaust from the vacuum pump is hot, so do not place anything flammable near the exhaust port. Failure to observe this precaution could cause a fire.



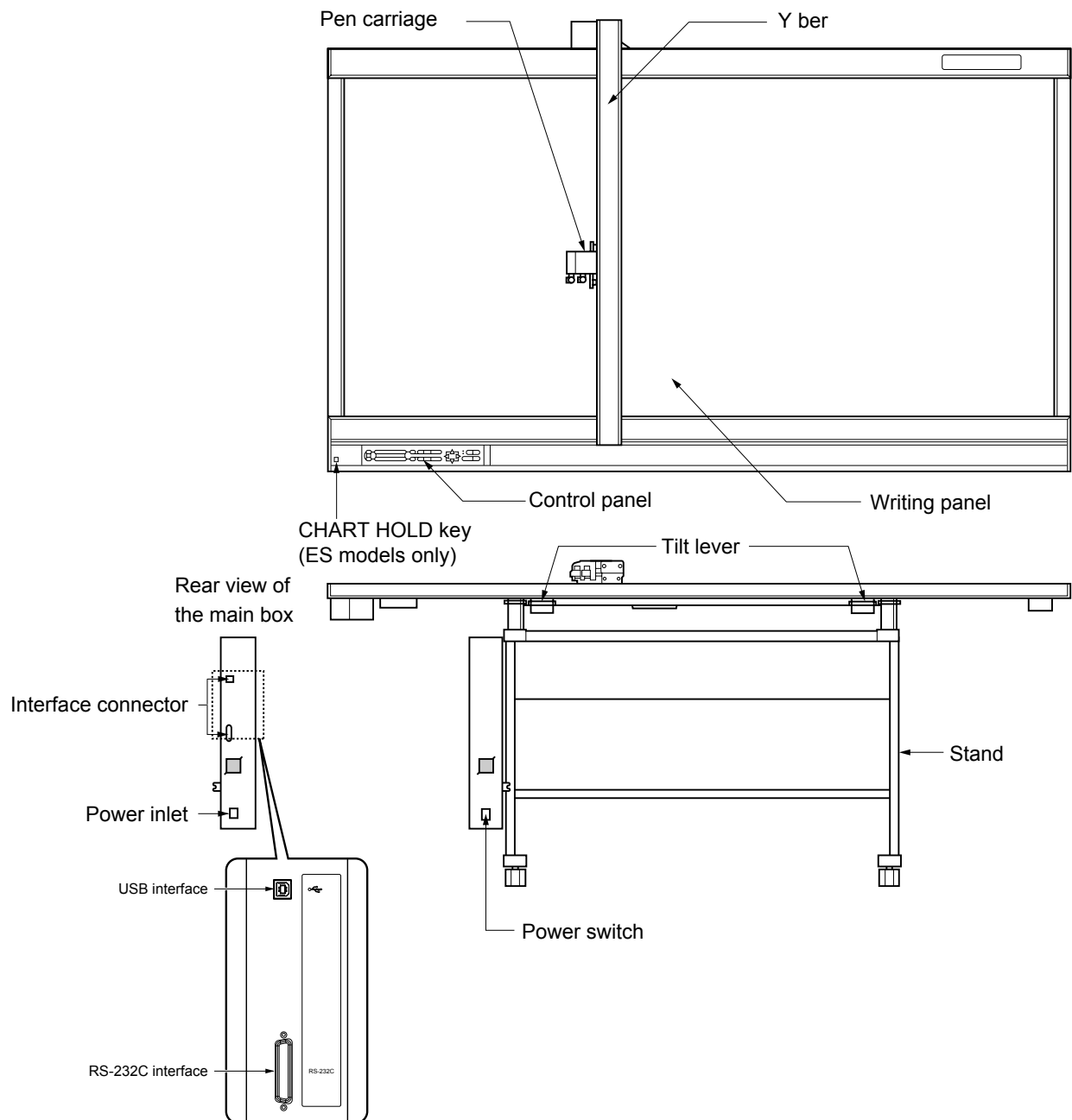
CHECKPOINT

A vacuum pump is not provided.

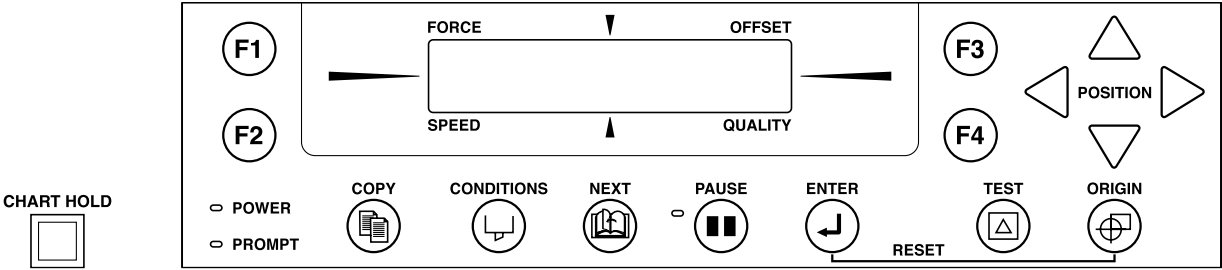
2. Description of Parts

2.1 Plotter Nomenclature

The names of the plotter parts are as follows.

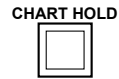


2.2 Control Panel



Indicator Lamps

- ☐ **POWER** The POWER lamp remains lit (green) while the plotter is on.
- ☐ **PROMPT** The PROMPT lamp lights (red) when the plotter receives data that will cause the pen carriage to move outside the effective cutting area or receives the “Prompt Light” command (T) from the computer.



(ES [electrostatic adhesion] models only)

.....Press the [CHART HOLD] key to enable the electrostatic adhesion function (the key’s lamp lights). Press it again to cancel the electrostatic adhesion function (the lamp goes off).

Panel Keys

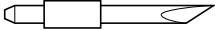
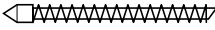
- F1** **F3** Depending on the menu being displayed, these keys are used to:
 - Load a group of cutting conditions retained in the plotter’s memory;
 - Shift the cursor when setting a numeric value for a function;
 - Select the desired submenu.
- F2** **F4**
 - All four keys are used to move the pen carriage when setting a function that requires the specification of a coordinate position.
 - The [$\triangle$] and [∇] keys are used to raise or lower the displayed numeric setting of a function.
 - The [$\triangleleft$] and [$\triangleright$] keys are used to select the pen type when setting a group of cutting conditions.
 - Press the [$\triangle$] key and the [ENTER] key concurrently to move the pen carriage to the upper right position and facilitate loading of the cutting medium.
- POSITION**
 - The [$\triangle$] and [∇] keys are used to raise or lower the displayed numeric setting of a function.
 - The [$\triangleleft$] and [$\triangleright$] keys are used to select the pen type when setting a group of cutting conditions.
 - Press the [$\triangle$] key and the [ENTER] key concurrently to move the pen carriage to the upper right position and facilitate loading of the cutting medium.
- COPY** Used to repeat the cutting operation defined by the data in the plotter’s receive buffer.
- CONDITIONS** Used to set the eight groups of cutting conditions retained in the plotter’s internal memory or to select one group as the current cutting conditions.
- NEXT** Used to select the desired menu screen for setting a function at the control panel when the plotter is in PAUSE mode.

PAUSE 	Press the [PAUSE] key to select PAUSE mode (its green lamp lights). Press it again to cancel PAUSE mode (the lamp goes off). Depending on the menu being displayed, this key is used to: • Temporarily suspend a cutting or plotting operation; • Set functions at the control panel; • Temporarily store data received from the computer in the plotter's buffer.
ENTER 	After setting a function at the display panel, press the [ENTER] key to register your setting. To reset the plotter, concurrently press the [ENTER] and [ORIGIN] keys.
TEST 	Runs a cutting test to check whether the currently selected cutting conditions are compatible with the medium loaded.
ORIGIN 	Used to move the origin point. To reset the plotter, concurrently press the [ENTER] and [ORIGIN] keys.

2.3 Types of Cutter Blades and Their Features

CAUTION

- Handle cutter blades with care!

Blade type	Blade features
Supersteel blades CB15U (ø1.5)  CB15U-K30 (ø1.5)  CB15U-SP (ø1.5)  CB15U-K30-SP (ø1.5)  CB09UA (ø0.9)  CB30UC (ø3.0) 	• Less expensive than other types of blades • The maximum cutting distance is about 4000 m (depending on the medium and cutting pressure used). • The spring ensures that the blade is lifted clear of the cutting medium when the pen is raised. Note: The CB15U-K30 and CB15U-K30-SP blades are designed for use with thick media e.g. rubber for sandblasting.

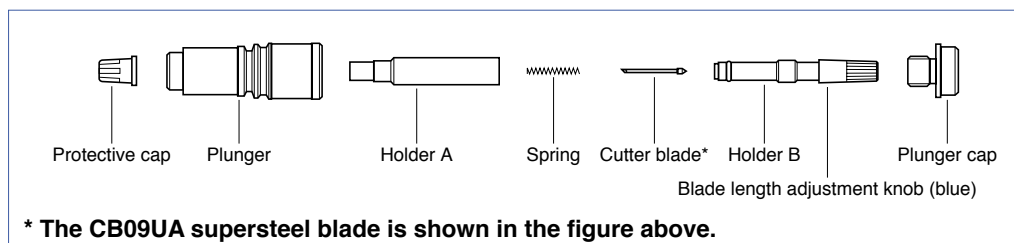
2.4 Cutter Pen Nomenclature

CAUTION

- Handle cutter blades with care!

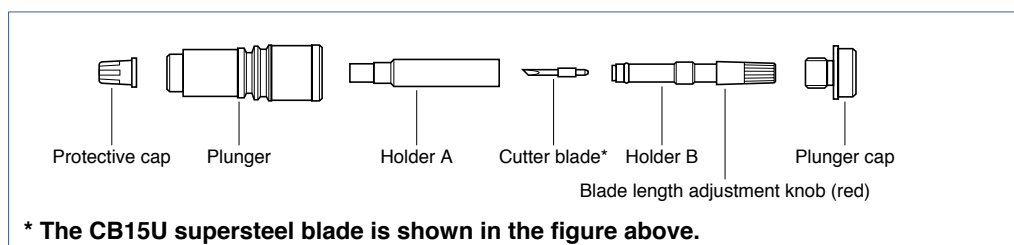
Structure of the PHP31-CB09-HS Cutter Pen

(for cutter blades of 0.9 mm diameter)



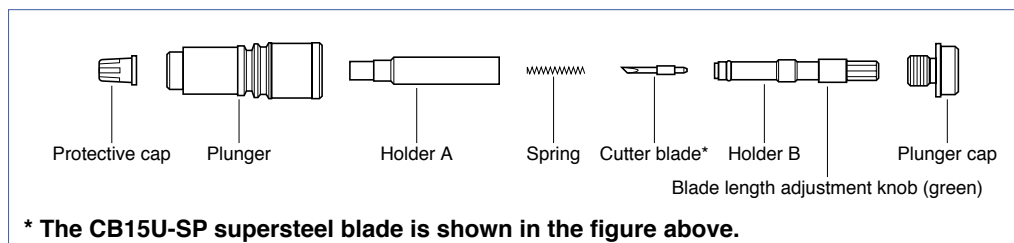
Structure of the PHP31-CB15-HS Cutter Pen

(for cutter blades of 1.5 mm diameter)



Structure of the PHP31-CB15B-HS Cutter Pen

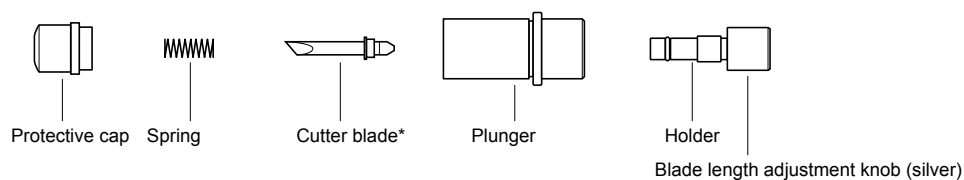
(for cutter blades of 1.5 mm diameter)



Structure of the PHP34-CB30-HS Cutter Pen

(for cutter blades of 3.0 mm diameter)

Cutter pen for 3.0-mm diameter blades fitted with a spring



3 Basic Operation

3.1 Replacing the Cutter Blade

There are three types of cutter pen. Each type has different diameter blades. The blade diameter is indicated by the color of the blade length adjustment knob as shown in the table below. When replacing the cutter blade, check the table below to ensure that you are using the correct combination of cutter pen and cutter blade.

CAUTION

Handle cutter blades with care!

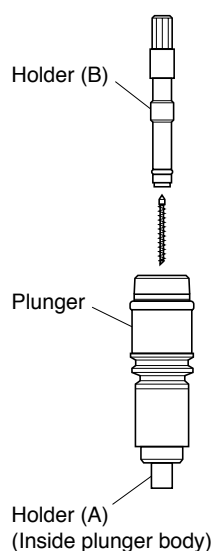
Color of the adjustment knob	Cutter pen part no.	Compatible blade types		
		Diameter	Part no.	Material
Blue	PHP31-CB09-HS	0.9 mm	CB09UA	Supersteel
Red	PHP31-CB15-HS	1.5 mm	CB15U	
			CB15U-K30	
Green	PHP31-CB15B-HS	1.5 mm	CB15U-SP	
			CB15U-K30-SP	
Silver	PHP34-CB30-HS	3.0 mm	CB30UC	

Replacing the Blade

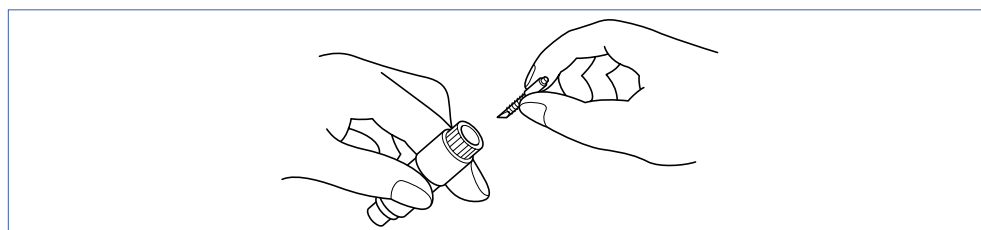
The procedure for blade replacement varies with the type of cutter pen used.

Color of the blade length adjustment knob: Blue

(PHP31-CB09-HS cutter pen for 0.9 mm blades)



1. Remove holder (B) by turning the blade length adjustment knob in the counterclockwise direction.
2. Remove the blade and spring from holder (A).
3. Attach the spring to the new blade. Next, with the tip of holder (A) facing downward and at an angle as shown, insert the new blade with the spring into the plunger.



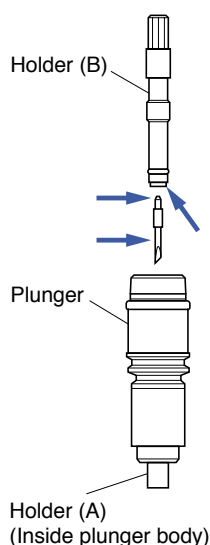
4. Make sure the blade is inserted straight into the holder. If the blade is positioned at an angle, gently tap the plunger to correct the orientation of the blade.
5. With the tip of holder (A) facing downward, replace holder (B) and then turn the blade length adjustment knob in the clockwise direction until the blade tip is visible.
6. Using your finger, check that the cutter blade rotates smoothly inside the cutter pen.

CAUTION

Be careful not to stab your finger when handling the cutter blade.

Color of the blade length adjustment knob: Red

(PHP31-CB15-HS cutter pen for 1.5 mm blades)



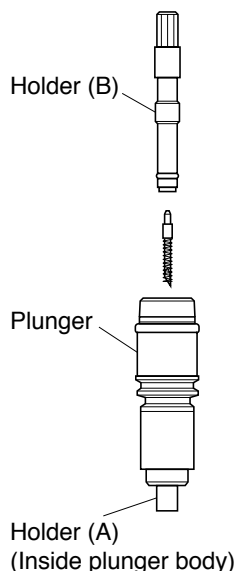
1. Remove holder (B) by turning the blade length adjustment knob in the counterclockwise direction.
2. Remove the blade from holder (A).
3. With the tip of holder (A) facing downward as shown, insert the new blade.
4. Make sure the blade is inserted straight into the holder. If the blade is positioned at an angle, gently tap the plunger to correct the orientation of the blade.
5. With the tip of holder (A) facing downward, attach the holder cap and then turn the blade length adjustment knob in the clockwise direction until the blade tip is visible.
6. Using your finger, check that the cutter blade rotates smoothly inside the cutter pen (be careful not to stab your finger at this time).
7. If the blade does not rotate smoothly or the blade falls off after attaching the cutter pen to the pen carriage, the inside of the holder is insufficiently lubricated. In this case, apply the grease provided to the three points indicated by arrows in the figure.

CAUTION

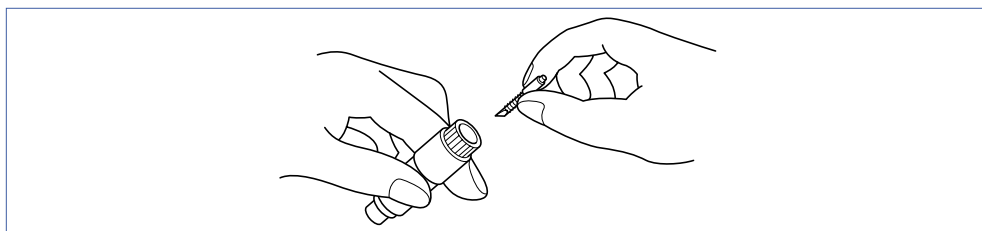
Be careful not to stab your finger when handling the cutter blade.

Color of the blade length adjustment knob: Green

(PHP31-CB15B-HS cutter pen for 1.5 mm diameter blades fitted with a spring)



1. Remove holder (B) by turning the blade adjustment knob in the counterclockwise direction.
2. Remove the blade and the spring from holder (A).
3. With the plunger held at an angle, and with the plunger cap pointing upward, insert the blade with its spring attached into the plunger. Take care that the spring does not fall off the blade.



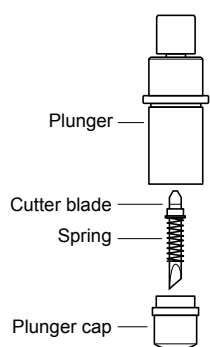
4. Make sure that the blade is inserted straight into the plunger. If the blade is inserted at an angle, gently tap the plunger to correct the orientation of the blade.
5. With the plunger still in the upright position, insert the holder cap until you hear it click into place. Turn the blade adjustment knob in the clockwise direction to adjust the length of the blade.

CAUTION

Be careful not to stab your finger when handling the cutter blade.

Color of the blade length adjustment knob: Silver

(PHP34-CB30-HS cutter pen for 3.0 mm diameter blades fitted with a spring)



1. Turn the blade length adjustment knob to retract the cutter blade inside the plunger.
2. Remove the plunger by turning the plunger cap in the counterclockwise direction.
3. Remove the cutter blade from the plunger.
4. Insert the replacement cutter blade with its spring attached inside the hole in the plunger cap.
5. Attach the plunger to the plunger cap with the cutter blade inserted into it by lowering the plunger onto the plunger cap.

CAUTION

Be careful not to stab your finger when handling the cutter blade.

3.2 Adjusting the Blade Length

CAUTION

Be sure to correctly adjust the blade length. If the blade length is too long for the thickness of the medium being used, you may damage the writing panel and the blade.

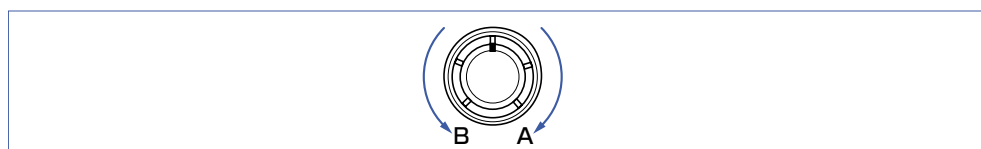
Adjusting the Blade Length

- (1) The blade length is adjusted by turning the blade adjustment knob (blue, red or green).

- To extend the blade, turn the knob in the A direction.
- To retract the blade, turn the knob in the B direction.

Use the scale on the plunger cap to determine how far to move the blade.

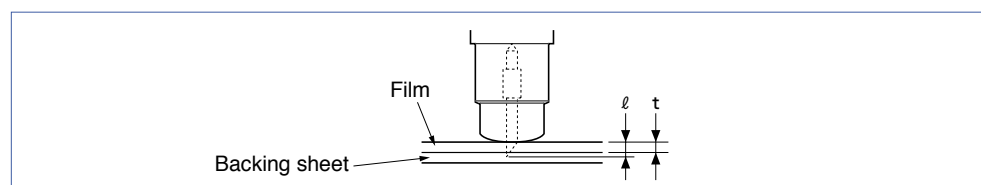
- When the knob is turned the distance of one scale unit, the blade moves 0.1 mm.
- When it is given one full turn, the blade moves 0.5 mm.



- (2) Align the blade tip with the tip of the cutter pen, and then extend the blade tip to suit the thickness of the medium being used.

Obtaining the Correct Blade Length

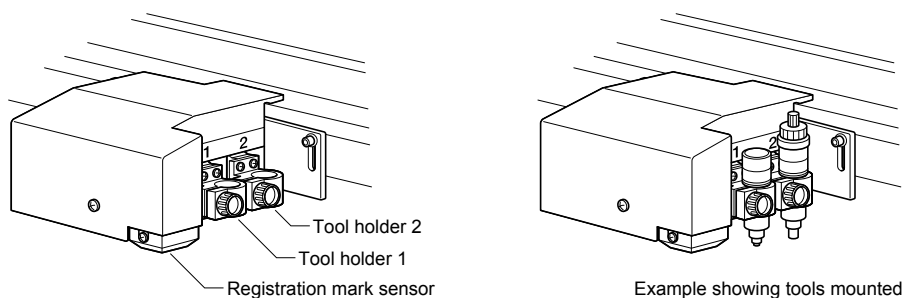
- (1) Assuming that the film thickness is " t ", the blade length should be equal to " ℓ ". Make sure that " ℓ " is never greater than the combined thickness of the film and its backing sheet.



If the film thickness cannot be accurately determined, adjust the blade length by gradually increasing it until only traces of the blade appear on the backing sheet when a cutting test is executed.

3.3 Mounting the Cutter Pen

When you are facing the pen carriage, the holder at the left is tool holder 1 and the holder at the right tool holder 2.



CHECKPOINT

Always mount the cutter pen in tool holder 2.

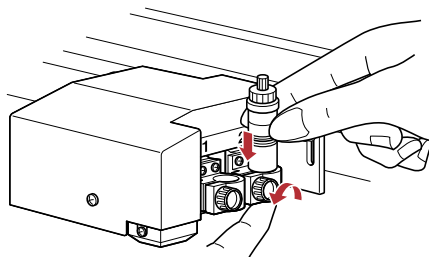
Even when mounting a cutter pen together with a different type of pen, always mount the cutter pen in tool holder 2.

CAUTION

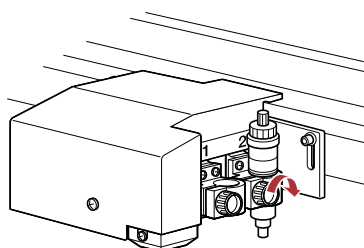
Push the pen all the way to the pen stopper section.

Take care not to touch the blade tip during the mounting operation.

- (1) Loosen the pen holder screw and mount the pen.



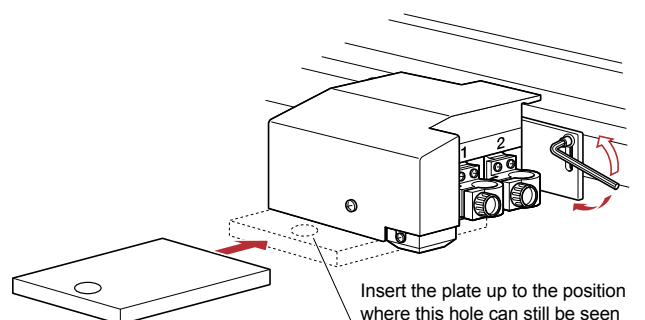
- (2) After mounting the pen, tighten the screw.



- Mount each of the pens in the same way as that used for 1-pen models.
- When facing the pens, the left pen is designated as No. 1 and the right pen is designated as No. 2.

3.4 Adjusting the Pen Carriage Height

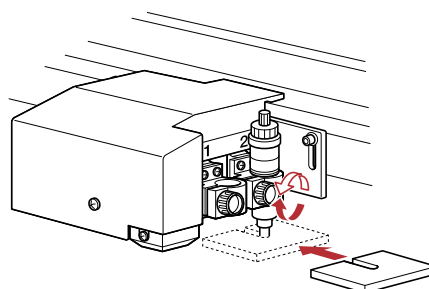
◆ Initial adjustment of the pen carriage height



- (1) Use the hexagon wrench to loosen the height adjustment bolt.
- (2) When the pen carriage can be moved freely up and down, insert the height adjustment plate (thick) under the pen carriage. Adjust the height of the pen carriage so that the pen carriage rests on top of the plate.
- (3) Use the hexagon wrench to tighten the height adjustment bolt. Make sure that the pen carriage is parallel to the writing panel.
- (4) When the adjustment is complete, remove the height adjustment plate (thick) from under the pen carriage.

◆ Height adjustment during cutter pen installation

- (1) Loosen the pen holder section screw and mount the pen.
- (2) Insert the height adjustment plate (thin) under the pen and adjust the height.



- (3) After mounting the pen, tighten the screw.
- (4) When the adjustment is complete, remove the adjustment plate (thin) from under the pen.

CHECKPOINT

Always make sure that the writing panel is in a horizontal position before making this adjustment. When cutting thick media, place the medium on the writing panel before making this adjustment.

3.5 Turning On the Plotter and Initialization

CAUTION Do not put your hands on the writing panel while turning on the plotter.

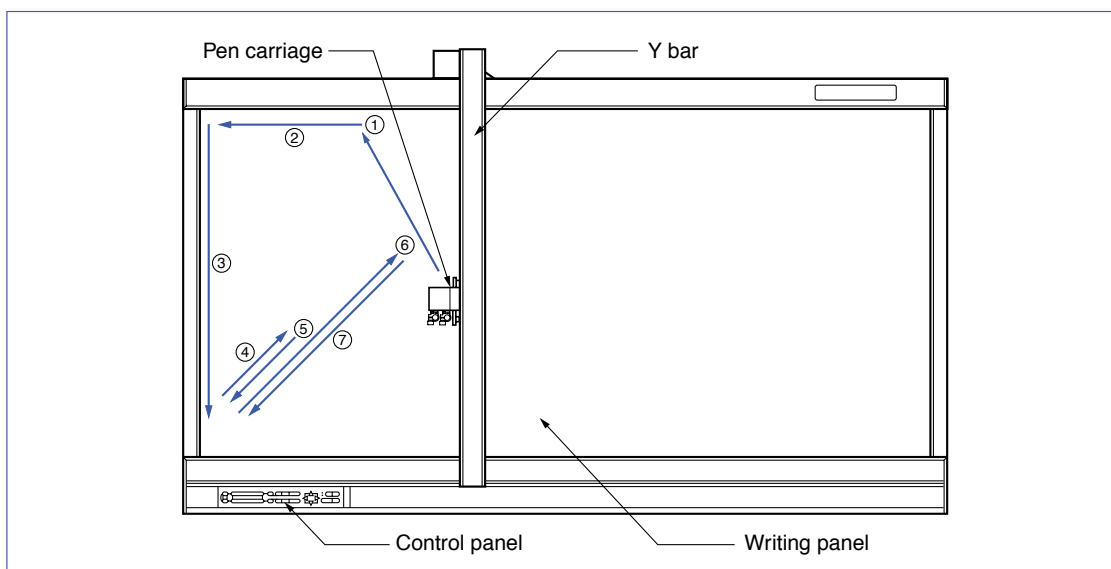
The moment you turn the power on, the plotter's Y bar and pen carriage will start to move.

Operations:

- (1) Make sure that the “O” (OFF) side of the power switch is pressed down.
- (2) Securely plug the connector end of the power cord into the plotter’s power inlet.
- (3) Securely plug the other end of the power cord connector into an electrical outlet of the specified voltage.
- (4) Press the “I” (ON) side of the power switch.
- (5) The green power lamp on the control panel will light, and the Y bar and pen carriage will start to move as shown in the figure below. These operations are part of the initialization process.

The figure below shows what the plotter does when the power is turned on.

The pen carriage returns to the origin point for plotting, and then moves back and forth twice at a 45° angle from the origin to determine the friction coefficient of the plotter mechanisms.



- (6) When the initialization process is complete, the plotter is ready to begin plotting or cutting.

3.6 Loading the Medium

CHECKPOINT

- This plotter is available with a magnetic writing panel, a vacuum suction writing panel, or an electrostatic writing panel. Note that the medium is loaded differently depending on the media hold-down method.
- If air gets in between the writing panel and the medium during loading, force out the air and ensure that the medium is securely attached to the writing panel before cutting.
- When loading a medium with no backing sheet, spread a vinyl backing sheet or something similar on the panel before cutting.
- When loading a medium that cannot be securely attached using the basic hold-down method, reinforce adhesion by using tape on all four sides.
- Common spray glue is often used for this purpose. However, since the spray glue remover contains an anti-static agent, do not use it directly on the writing panel of models which feature electrostatic media hold-down.

Magnetic (models feature an ivory writing panel)

- (1) Place the medium on the writing panel.
- (2) Secure the edges of the medium with the steel holder plates, which are supplied with your plotter as standard accessories.

Vacuum suction (models feature a green writing panel)

- (1) Place the medium on the writing panel.
- (2) Turn on the vacuum pump's power supply.

CHECKPOINT

- A vacuum pump is not supplied as a standard accessory. It must be purchased separately.
- Be sure to select a vacuum pump which is affixed with either a label showing compliance with the relevant safety standard or with the CE marking.
- Refer to Section 1.8 for pump selection and connection instructions.

Electrostatic adhesion (models feature a black writing panel)

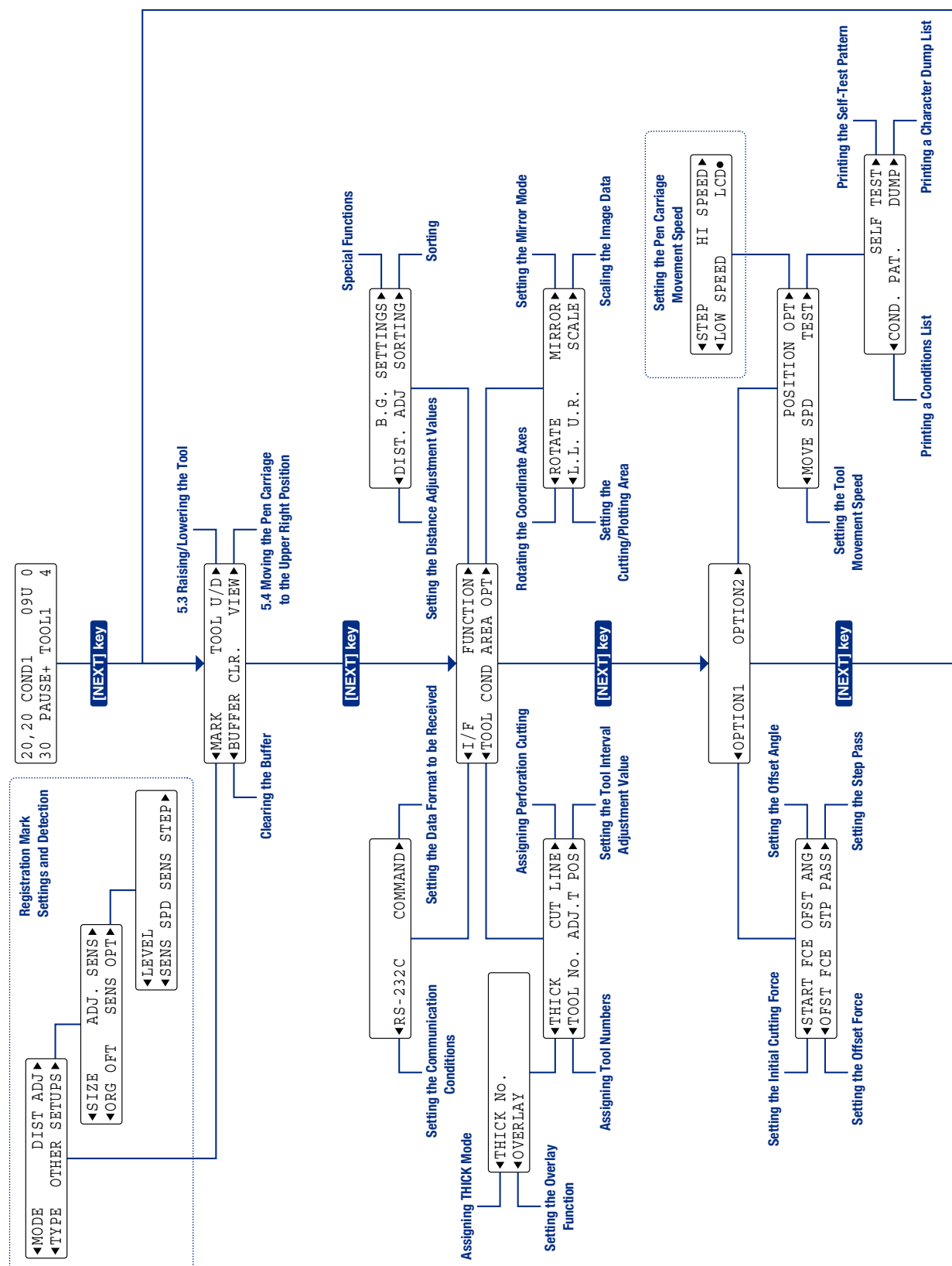
- (1) Make sure the power is turned ON.
- (2) Place the medium on the writing panel.
- (3) Press the [CHART HOLD] key on the control panel.
- (4) The green [CHART HOLD] key lamp lights to indicate that the medium is being held by electrostatic adhesion.

CHECKPOINT

- Press the [CHART HOLD] key again to release the electrostatic adhesion. The green lamp will no longer be lit.
- After the medium has been held for a while by electrostatic adhesion, it may become charged with static electricity and therefore be harder to remove from the writing panel. There is nothing abnormal about this phenomenon.

3.7 PAUSE Menu Configuration

When the plotter is in PAUSE mode, each of the functions listed below in the “Function selection” column can be accessed by pressing the NEXT key until the desired menu appears and then pressing the function key indicated by a box.



3.8 Setting the Cutting Conditions

This function lets you register eight different groups of cutting conditions in the plotter's memory. The cutting conditions stored in memory are referred to as setting conditions. Specify each group of setting conditions to match a particular media type.

The setting conditions can also be freely changed as required. Use the [F1] through [F4] keys on the control panel to move through the eight groups of setting conditions that are stored in memory until you locate the one that is suitable for the media type you will be using. Two groups of setting conditions are assigned to each of the four keys, and each of the eight groups is labeled with a CONDITION number to enable easy identification.

In this section, we will describe the setting procedures for the cutting force (pen force, creasing force), speed, cutter blade type/offset, creaser, quality, Thick Mode and the perforation length.

- Cutting force (pen force, creasing force): FORCE
- Speed: SPEED
- Cutter blade type/offset: OFFSET
- Creaser
- Quality: QUALITY
- Setting the thick mode
- Setting the perforation length

With the plotter in Ready status, press the [F1] through [F4] key corresponding to the setting condition number for which you wish to make settings.

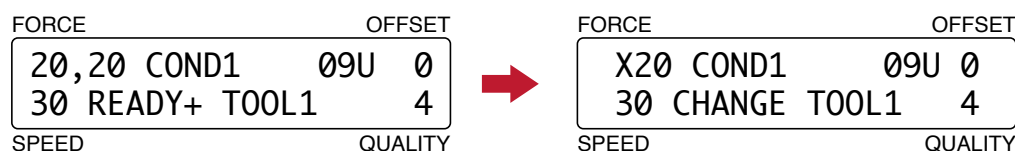
Setting condition numbers 1 and 5 are assigned to [F1], 2 and 6 to [F2], 3 and 7 to [F3], and 4 and 8 to [F4].

For example, if the [F1] key is pressed when COND 1 has been selected, the display changes to COND 5.

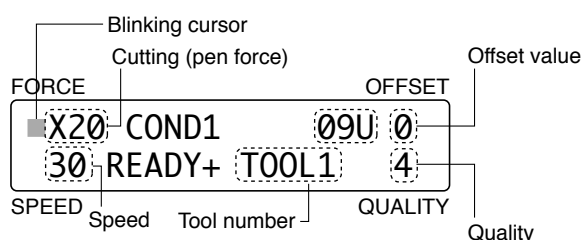
If a condition number other than 1 was selected, COND 1 will be displayed when the [F1] key is pressed. In the same way, press [F2] to select COND 2 and 6, [F3] to select COND 3 and 7, and [F4] to select COND 4 and 8.

- (1) Press the [CONDITIONS] key.

The lower row of the display changes from "READY+ TOOL1" to "CHANGE TOOL1". (The display will differ according to the setting conditions that have been made.)



- (2) The setting condition parameters are displayed as shown below.

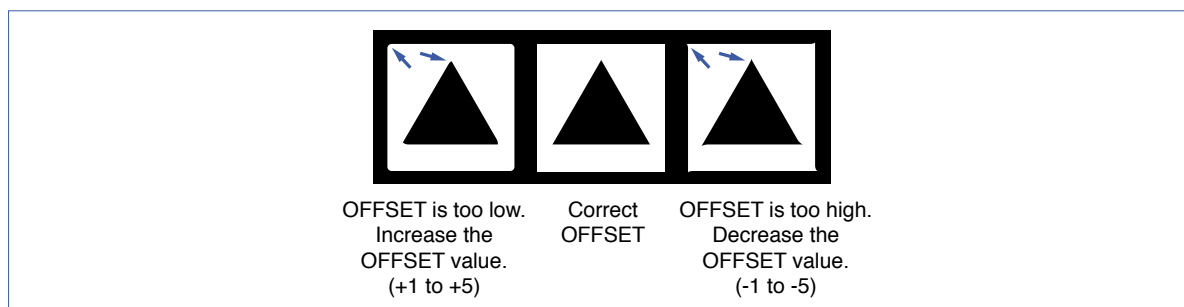


The values that can be set for each parameter are shown in the following table.

Condition	Range		Remarks
Cutting force (FORCE)	Pen 1: 1 to 40 Pen 2: 2 to 80		40 steps 40 steps, even numbers only.
Cutter blade type/offset (OFFSET)	Cutter blade type		*1 Choose 0 for automatic setting of the optimum offset for the selected blade type.
	09U, 15U, 15UK30, 15-10C, 15-05S, 30U, CP002 (Creaser), CP003 (Creaser)	-5 to +5 (*1)	
	Other	1 to 99	
	CP001 (Creaser), PEN		
Speed (SPEED)	1 to 10, 15, 20, 25, 30, 35, 40		Unit: cm/s
Quality (QUALITY)	1 to 6		The lower the number, the higher the quality.
Tool No. 1,	1, 2		

- (3) Press a key from [F1] to [F4] to move the blinking cursor to the parameter that you wish to set.
- (4) Change the setting value of the parameter that you wish to set.
- (5) Press the [ENTER] key to register the setting conditions in the plotter's internal memory. To cancel your settings, press the [NEXT] key.
- (6) Press the [TEST] key to perform test cutting. Make any adjustments required by changing the settings to suit the media type and thickness.

Use the [TEST] key to perform test cutting. Adjust the OFFSET value to suit the type and thickness of the medium being used, and fine-adjust the finish of the corner sections.



- If [OTHER] has been specified as the blade type, the OFFSET value can be set in a range of 1 to 45.
- The OFFSET value is not displayed for plotting mode.

CHECKPOINT

- Your settings are retained even while the plotter is turned off.
- The FORCE and SPEED values, in particular, should be initially set to low values and gradually raised while running cutting tests.

Press the [F4] key to return to the previous display.

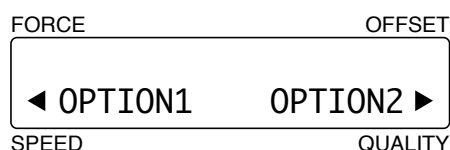
3.9 Printing a Conditions List

This function allows you to print a list of the current cutting/plotting settings (conditions).

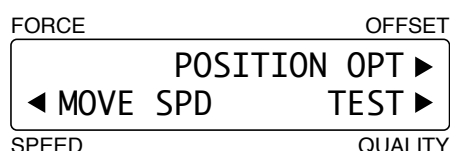
CAUTION

The pen carriage starts moving as soon as this function has been selected. To avoid injury to yourself or damage to the plotter, keep your hands and other obstacles out of the vicinity of any moving parts.

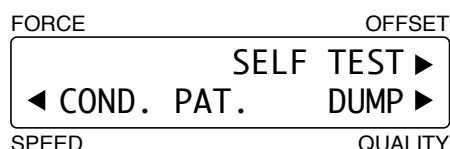
- (1) If you want to print out the list of cutting/plotting conditions of one sheet of paper, load a sheet of paper that is A3 size or larger in the plotter.
- (2) Mount a plotting pen.
- (3) Press the [PAUSE] key to select PAUSE mode.
- (4) Press the [NEXT] key until the following menu is displayed.



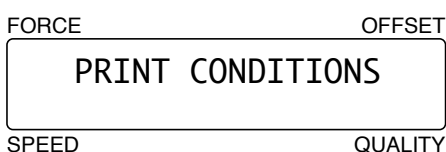
- (5) Press the [F4] key (OPTION2) to display the following menu.



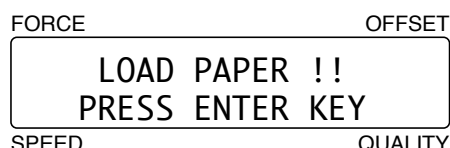
- (6) Press the [F4] key (TEST) to display the following menu.



- (7) Use the POSITION keys to move the pen carriage (the tip of the tool selected by the current setting) to the position where you want to print the list. Next, press the [F2] key (COND. PAT.). The following message appears on the LCD and the plotter begins printing "Condition Settings Page 1".



- (8) When this page has been printed, the following message appears on the LCD.



Replace the medium if required or use the position keys to move the pen carriage (the tip of the tool selected by the current setting) to the position where you want to print the second list.

Press the [ENTER] key to print "Condition Settings Page 2"

- (9) When all of the conditions have been printed, the READY message reappears.

Cutting/Plotting Conditions List

FC2250 CONDITIONS PAGE 1

COND. FORCE SPEED TOOL

OFFSET ACCEL TOOL No.

*1 12 20 PEN

0 3 1

2 14 30 09U

0 3 1

3 17 20 15U

0 3 1

4 12 20 PEN

0 3 1

5 50 5 15U

0 1 2

6 30 10 15U

0 3 2

7 30 10 15U

0 3 2

8 30 5 15U

0 1 2

RS-232C BAUD RATE PARITY DATA BIT HANDSHAKE

*1 9600 N 8 H

2 9600 E 7 H

3 9600 E 8 H

COMMAND HP-GL HP-GL ORIGIN CENTER

TOOL UP SPEED AUTO STEP PASS 1

OFFSET FORCE 4 OFF SET ANGLE 30

ROTATE OFF SCALE 1

DISPLAY UNIT inch SORT OFF

INIT. DOWN FORCE 2 4 4 4 4 4 4

DISTANCE ADJUST 0.00, 0.00

COND. THICKMODE OVERCUT1 OVERCUT2 OVERLAY CUT L. PAT.

1 OFF 1 0.008" 0.008" 1 OFF

2 OFF 1 0.008" 0.008" 1 OFF

3 OFF 1 0.008" 0.008" 1 OFF

4 OFF 1 0.008" 0.008" 1 OFF

5 OFF 1 0.008" 0.008" 1 OFF

6 OFF 1 0.008" 0.008" 1 OFF

7 OFF 1 0.008" 0.008" 1 OFF

8 OFF 1 0.008" 0.008" 1 OFF

MARK MODE 3POINT

MARK TYPE 2

MARK SIZE 0.80"

MARK DIST. ADJ. OFF

MOVE POSITION 1 0." 0." 0."

2 0." 0." 0."

3 0." 0." 0."

MARK OFFSET 0.000" 0.000" 0.000"

MARK SENSOR ADJ X: 0.000" 0.000" 0.000"

Y: 0.000" 0.000" 0.000"

FC2250 CONDITIONS PAGE 2

W COMMAND

TOOL UP

COND. PRIORITY

COMMAND

MODEL EMULATED

7586

INIT. BLADE CTRL

0.08" BELOW

TOOL SELECT

ENABLED

PAUSE KEY

MENU

TOOL UP MOVE

DISABLED

HP-GL CIRCLE

DEFAULT

TOOL SEL. WAIT

DISABLED

ROM VERSION

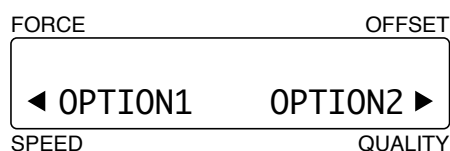
3.10 Printing a Character Dump List

This mode enables you to check whether data is being transferred correctly from the computer to the plotter. If the output data and the program data are different, check the transmission conditions and the cable connections.

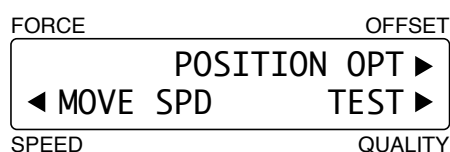
CAUTION

The pen carriage starts moving as soon as the DUMP mode has been selected. To avoid any injury to yourself or damage to the plotter, keep your hands and other obstacles out of the vicinity of any moving parts.

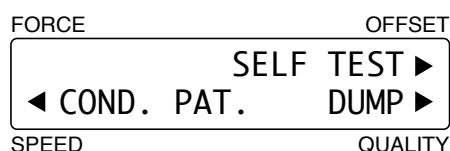
- (1) Load a medium in the plotter.
- (2) Mount a plotting pen.
- (3) Press the [PAUSE] key to select PAUSE mode.
- (4) Press the [NEXT] key until the following menu is displayed.



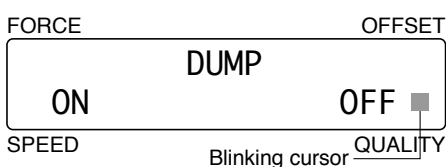
- (5) Press the [F4] key (OPTION2) to display the following menu.



- (6) Press the [F4] key (TEST) to display the following menu.



- (7) Press the [F4] key (DUMP) to display the character dump menu.



The currently selected setting is indicated by a black dot [•].

To select DUMP mode, press the [F2] key to shift the black dot next to ON.

If you decide not to select DUMP mode, press the [F4] key to shift the black dot next to OFF.

- (8) Press the [ENTER] key. If DUMP mode has been selected, DUMP appears on the display to indicate that the plotter has entered DUMP mode.
- (9) Transmit the data from the computer. A character dump list is printed.
- (10) When all of the data has been printed, turn off the plotter to cancel DUMP mode.

CHECKPOINT

- The character data is printed as ASCII codes. Data that is not in the ASCII code charts is plotted as two-digit hexadecimal values.
 - When the plotter receives READ commands that instruct it to output data, it will output dummy data (except in the case of READ commands that request the output of the plotter's status).
-

3.11 Printing the Self-Test Pattern

The self-test function enables the plotter to check its own functions by drawing a self-test pattern.

CAUTION

The pen carriage starts moving as soon as the SELF TEST mode has been selected. To avoid any injury to yourself or damage to the plotter, keep your hands and other obstacles out of the vicinity of any moving parts.

- (1) Load a medium in the plotter.
- (2) Mount a plotting pen.
- (3) Press the [PAUSE] key to select PAUSE mode.
- (4) Press the [NEXT] key until the following menu is displayed.

FORCE	OFFSET
◀ OPTION1 OPTION2 ▶	
SPEED	QUALITY

- (5) Press the [F4] key (OPTION2) to display the following menu.

FORCE	OFFSET
◀ MOVE SPD POSITION OPT ▶ TEST ▶	
SPEED	QUALITY

- (6) Press the [F4] key (TEST) to display the following menu.

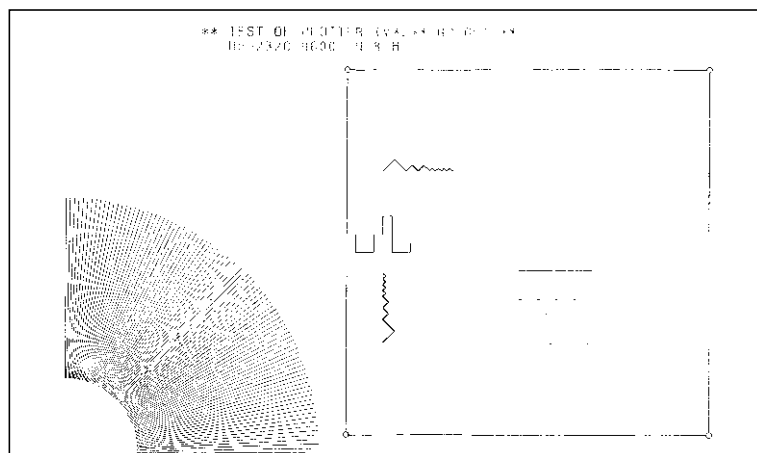
FORCE	OFFSET
◀ COND. PAT. SELF TEST ▶ DUMP ▶	
SPEED	QUALITY

- (7) Press the [F3] key (SELF TEST) to display the test pattern menu.

FORCE	OFFSET
◀ YES SELF TEST ? NO ▶	
SPEED	QUALITY

Press the [F2] key (YES) to initiate plotting of the self-test pattern.

Press the [F4] key (NO) to return to the OPTION select on menu shown in Step (4).



- (8) When you have finished plotting the self-test pattern, turn off the plotter to cancel SELF TEST mode. The self-test pattern is repeatedly plotted until the plotter is turned off. To discontinue plotting even if a pattern is not completely plotted, simply turn off the plotter.

4. Daily Maintenance and Storage

During daily maintenance, pay particular attention to the following points.

1. Do not lubricate the plotter mechanisms.
2. To clean the plotter's casing, either wipe the soiled areas with a dry cloth or with a cloth that has been dampened with a neutral detergent diluted with water.

CAUTION

Do not use paint thinner, benzine, alcohol, or similar solvents as they may damage the casing's finish.

3. If the writing panel surface is soiled, wipe it with a dry cloth. If the surface is extremely dirty, dampen the cloth with a diluted solution of neutral detergent or alcohol.

CAUTION

Do not use paint thinner, benzine, or similar solvents on the writing panel. They will damage the surface.

When the plotter is not in use, follow the instructions listed below.

1. Remove the pen from the pen carriage and store it with the pen cap on.
2. Cover the plotter with the soft cover supplied or a cloth to keep dust off.
3. Store the plotter in a location which is not subject to either direct sunlight or high humidity.

5. RECOMMENDED PARTS LIST

No.	Part No.	Description	Q'ty	Remarks
1	792240700	Main Board	1	
2	792232706	2-Pen T Board	1	
3	792256711	FC2250 Block Assy	1	
4	682247030	Control Panel Switch	1	Same as FC2240
5	772290110	X-Motor	1	
6	772247550	Y-Motor	1	
7	682247530	Power Supply LEP100F-36	1	
8	692256220	X-Flexible Cable, FPC612122	1	FC2250-60/120
	692256230	X-Flexible Cable, FPC612123	1	FC2250-180
9	162291101	Y-Flexible Cable FCA2291010A	2	
10	022904331	Y-Flexible Cable Reinforcement	1	
11	022904500	X-Belt S2ML2350	2	FC2250-60
	022904510	X-Belt S2ML3200	2	FC2250-120
	022904520	X-Belt S2ML4200	2	FC2250-180
12	022904500	Y-Belt S2ML2350	1	
13	792256701	Main Relay Board	1	
14	772219660	Power Relay Board, PN5042-04	1	
15	792256703	X-Y Relay Board	1	
16	792256708	FC2250 X Sensor Board	1	
17	792256709	FC2250 Y Sensor Board	1	
18	792256710	FC2250 Registration Mark Sensor Assy	1	
19	792256702	FC2250 X FPC Relay Board	1	
20	792256704	FC2250 Y FPC Board 1	1	
21	792256705	FC2250 Y FPC Board 2	1	

6. LIST OF TOOLS

6.1 Tools

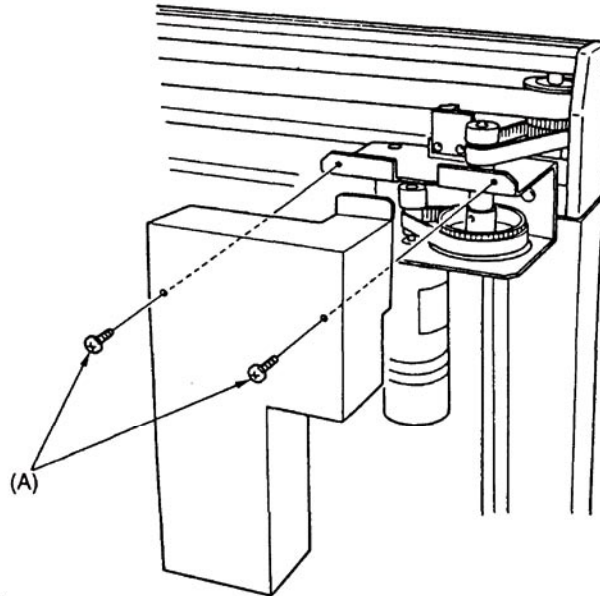
No.	Tool	Adjustment Item
1	Colex gauge (force gauge) 500 gf	Pen force adjustment
2	Colex gauge (force gauge) 300 gf	Pen force and belt tension adjustment
3	Colex gauge (force gauge) 50 gf	Pen force adjustment
4	Cutter pen	Pen force adjustment
5	Push-pull gauge 5 kg	Belt tension adjustment
6	Push-pull gauge 2 kg	Belt tension adjustment
7	Push-pull gauge 1 kg	Belt tension adjustment
8	Glass scale (1000 mm)	Distance adjustment
9	Ceramic pen (ø0.2 mm)	Distance adjustment
10	PC, Centronics I/F cable	Firmware update
11	Phillips screwdriver M5	
12	Phillips screwdriver M4	
13	Phillips screwdriver M3	
14	Phillips screwdriver M2	
15	Small flat-head screwdriver	For adjusting the variable resistors on the board
16	Hexagon wrench 1.5 mm span	For M3 set-screws
17	Hexagon wrench 2.0 mm span	For M4 set-screws
18	Hexagon wrench 2.5 mm span	For the pen block set-screws
19	Box wrench 5.5 mm span	For removing M3 nuts
20	Bond-type adhesive	For securing screws
21	Double-sided tape (10 mm, 5 mm wide)	For securing the FPC cables
22	Ethyl alcohol	For cleaning the electrostatic adhesion plate and rail
23	Metallic ruler (about 15 cm long)	For adjusting the belt tension
24	Multimeter	For checking damaged or shorted wires

7. DISASSEMBLY AND ADJUSTMENT

7.1 Adjusting the X-Axis Drive

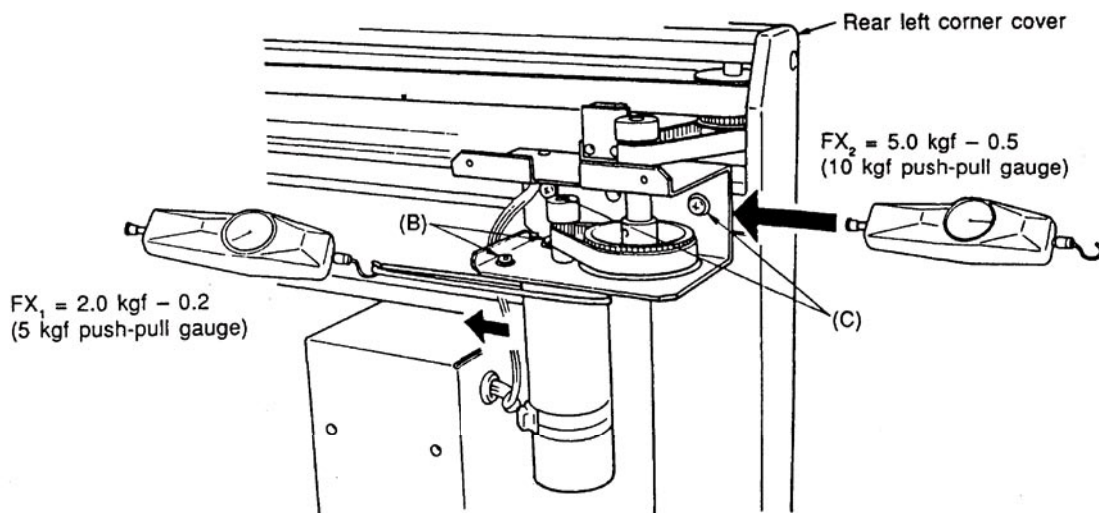
7.1.1 Removing the X Motor Cover

Remove the two M3 binding head screws indicated by the (A) arrows, then remove the motor cover.



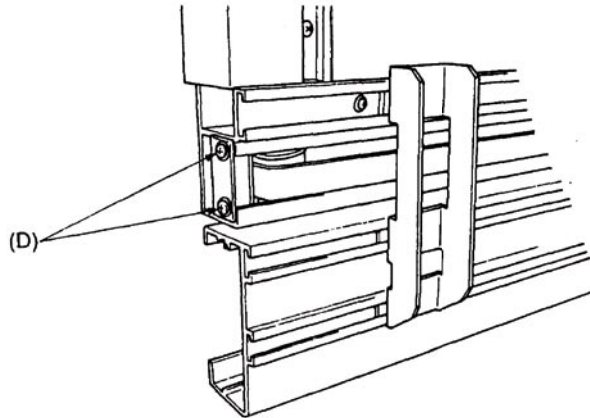
7.1.2 Adjusting the X Drive Belt Tension

- (1) Remove the rear left corner cover.
- (2) After loosening the two M3 binding head screws indicated by the (B) arrows, attach a string around the X motor and pull the X motor with a 5 kgf push-pull gauge to the point where FX_1 equals 2.0 kgf - 0.2, then tighten the screws.
- (3) After loosening the two M4 binding head screws indicated by the (C) arrows, push the X motor bracket with a 10 kgf push-pull gauge to the point where FX_2 equals 5.0 kgf - 0.5, then tighten the two screws.



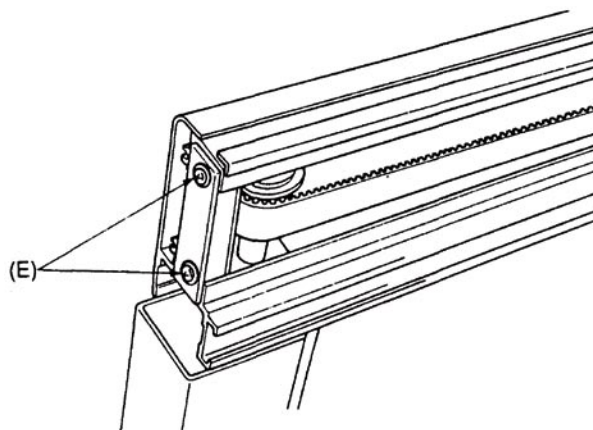
7.1.3 Adjusting the Belt Tension of the Front X Slider

- (1) Remove the front and rear right corner covers.
- (2) Adjust the two M3 binding head screws indicated by the (D) arrows so that the belt is balanced right and left.
 - * Turn the screws to the right to tighten the belt.
 - * Turn the screws to the left to loosen the belt.
- (3) Check the belt tension. (See subsection 7.1.5, "Checking the Belt Tension of the Front and Rear X Sliders".)
- (4) Perform the radiating lines test to check that the belt at the pulley section is balanced right and left.
If not, repeat steps (2) to (4) above so that the belt is balanced.



7.1.4 Adjusting the Belt Tension of the Rear X Slider

- (1) Remove the rear right corner cover.
- (2) Adjust the two M3 binding head screws indicated by the (E) arrows so that the belt is balanced right and left.
 - * Turn the screws to the right to tighten the belt.
 - * Turn the screws to the left to loosen the belt.
- (3) Check the belt tension. (See subsection 7.1.5, "Checking the Belt Tension of the Front and Rear X Sliders".)
- (4) Perform the radiating lines test to check that the belt at the pulley section is balanced right and left.
If not, repeat steps (2) to (4) above so that the belt is balanced.



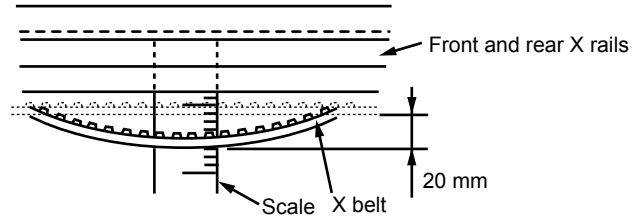
7.1.5 Checking the Belt Tension of the Front and Rear X Sliders

Checking the Belt Tension

- (1) Move the Y bar against the mechanical stopper on the left side.
- (2) Loosen the screws that holding the tilt lever bracket and then move the tilt lever bracket to avoid touching the belt.
- (3) Pull the X-belt 20 mm from the X-rail in the center of the X-belt using a 1 kg push-pull gauge.

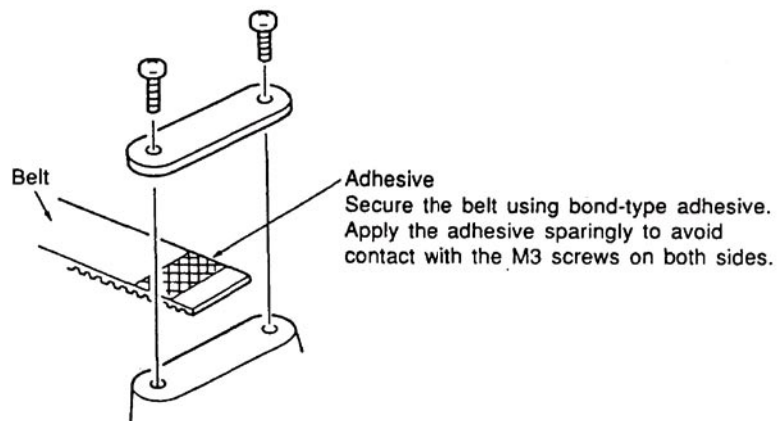
The pull force should be:

FC2250-60	FC2250-120	FC2250-180
920g to 940g	480g to 500g	350g to 370g



NOTES:1. If the belt tension has been adjusted, confirm that the Y bar is perpendicular.

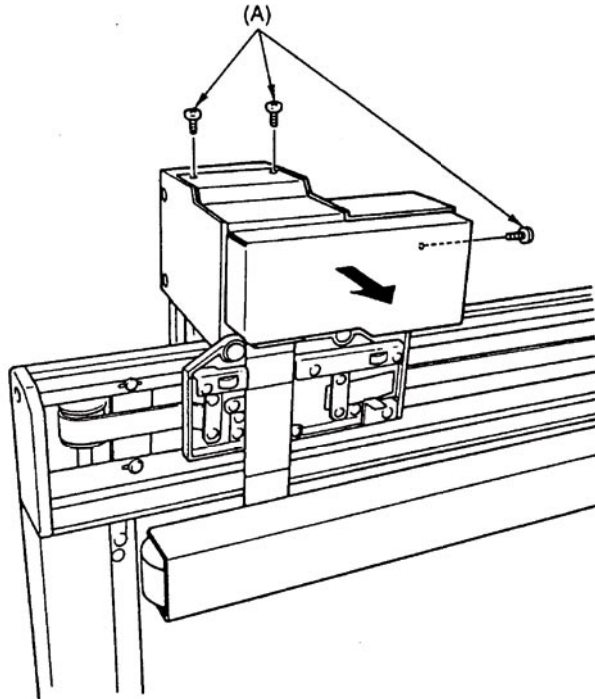
2. If the belt has been completely removed from the holder, secure it with adhesive to prevent looseness.



7.2 Adjusting the Y-Axis Drive

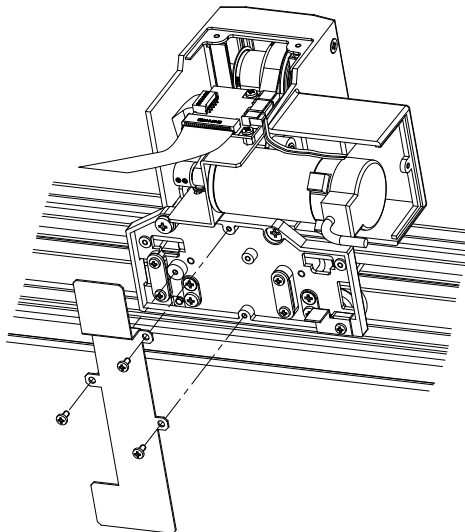
7.2.1 Removing the Y Motor Cover

Remove the three M3 binding head screws indicated by the (A) arrows, then remove the Y motor cover in the direction indicated by the arrow.



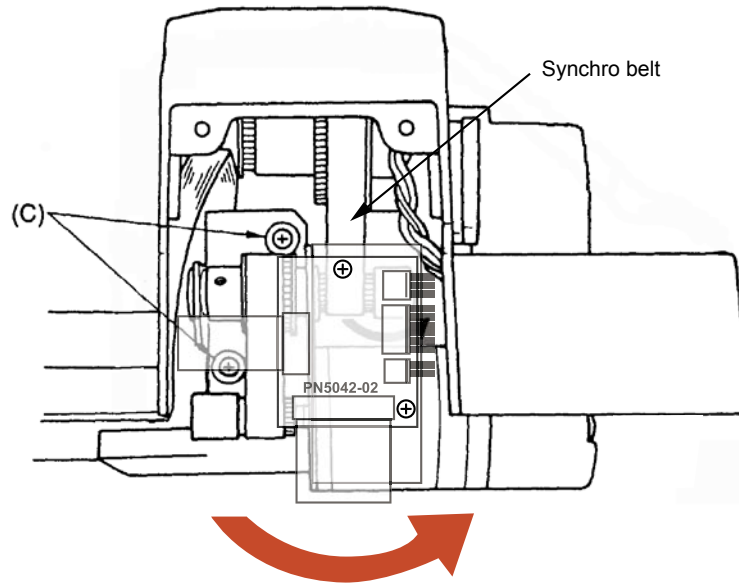
7.2.2 Removing the Y Motor

- (1) Remove the three M3 binding head screws holding the X FPC (Flexible Printed Circuit) cable holder, then remove the X FPC cable holder.
- (2) Disconnect X FPC and Y FPC cables from their connectors on the X-Y relay board.

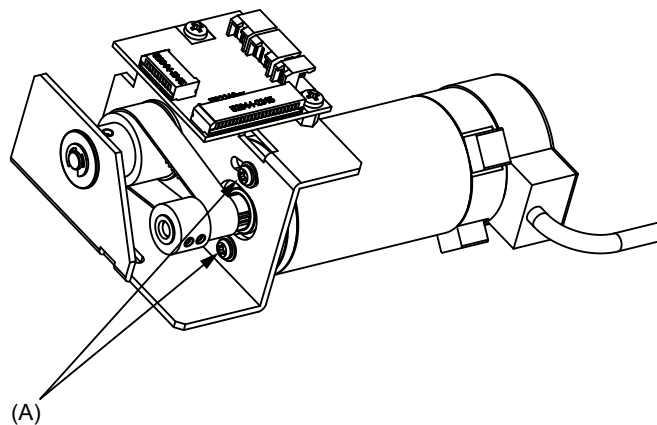


7. DISASSEMBLY AND ADJUSTMENT

- (3) Disconnect the Y motor and Y encoder cable cables from their connectors on the X-Y relay board.
- (4) As shown in the figure, remove the two M4 binding head screws indicated by the (C) arrows, then slip the synchro belt indicated by the arrow off of the motor pinion gear and remove the entire motor bracket.

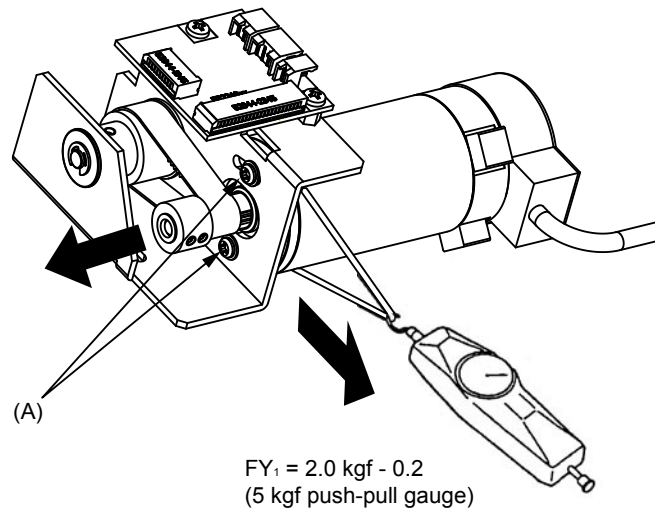


- (5) As shown in the figure, remove the two M3 binding head screws (A) holding the Y-motor, then remove the motor from the motor bracket.

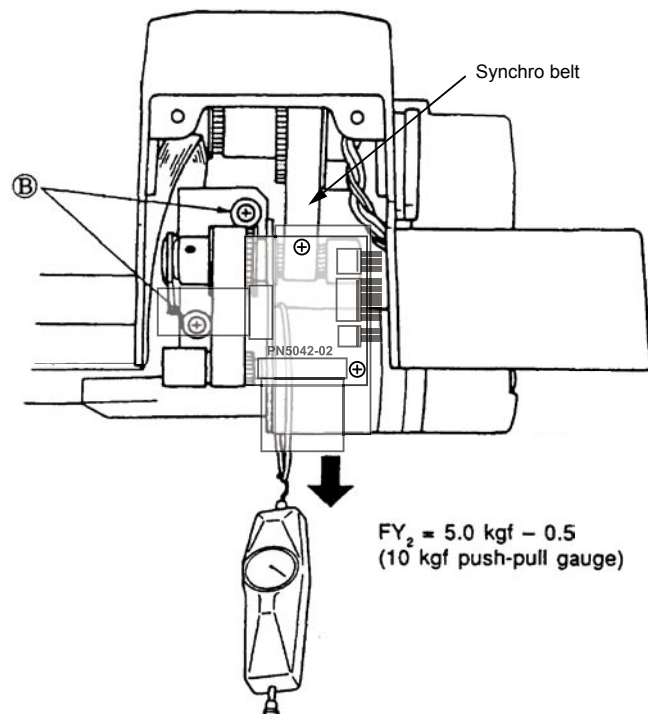


7.2.3 Adjusting the Y Drive Belt Tension

- (1) After loosening the two M3 binding head screws indicated by the (A) arrows in the figure below, attach a string around the Y motor and pull the Y motor with a 5 kgf pushpull gauge to the point where FY_1 equals $2.0 \text{ kgf} - 0.2$, then tighten the two M3 binding head screws.



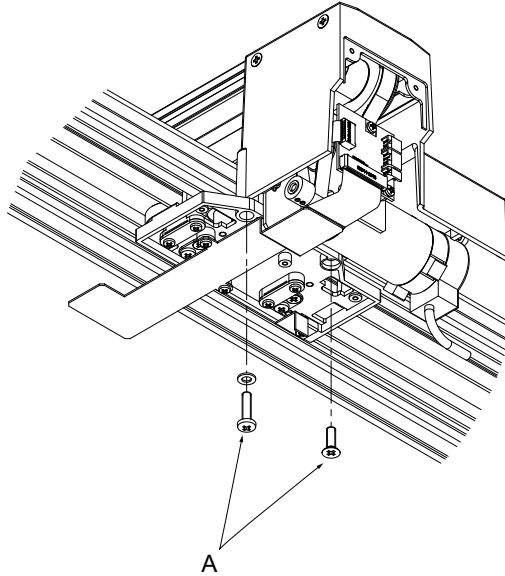
- (2) After loosening the two M4 binding head screws indicated by the (B) arrows in the figure below, attach a string around the Y motor and pull the Y motor assembly with a 10 kgf push-pull gauge to the point where FY_2 equals $5.0 \text{ kgf} - 0.5$, then tighten the two M4 binding head screws.



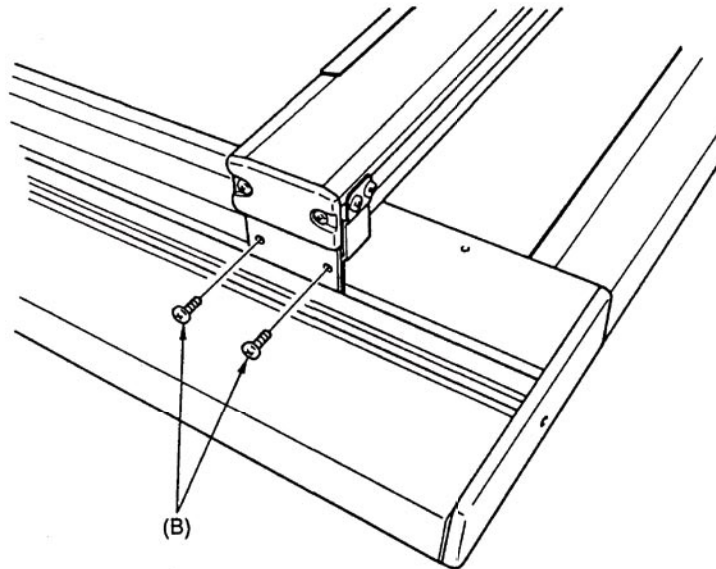
7.3 Adjusting the Y Slider

7.3.1 Removing the Y Bar

- (1) Remove the motor cover, then pull out the X FPC cable connector from the X relay board. (The pen block should be removed first.)
- (2) Remove the 5 mm bind screw and the countersunk head screw indicated by the (A) arrows.

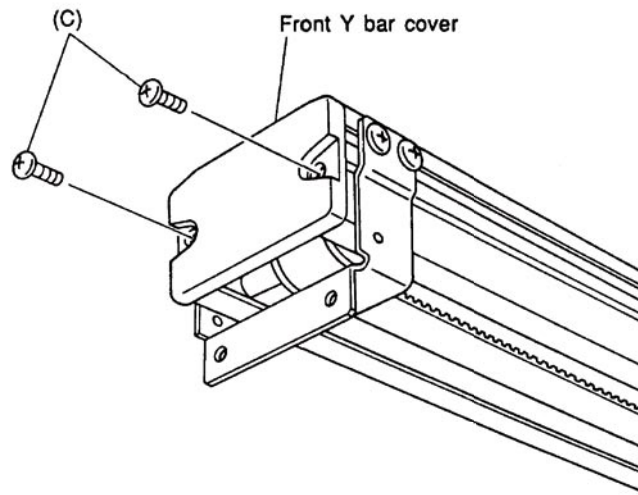


- (3) After removing the two M4 binding head screws indicated by the (B) arrows at the front surface, use both hands to lift the Y bar up and off.



7.3.2 Adjusting the Y Slider Belt Tension

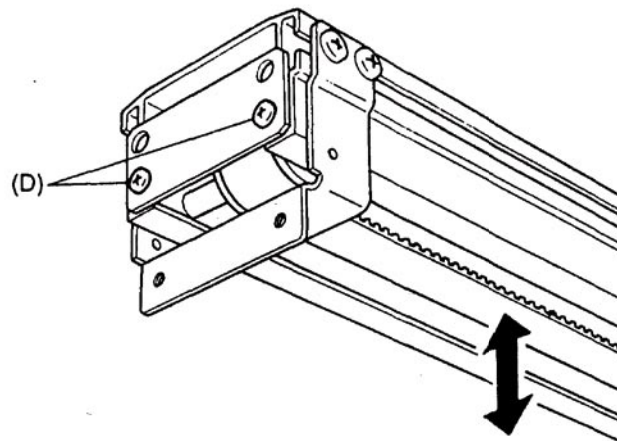
- (1) Remove the two M4 binding head screws indicated by the (C) arrows, then remove the front Y bar cover.



- (2) Adjust the two M3 binding head screws (D) so that the belt is balanced right and left.

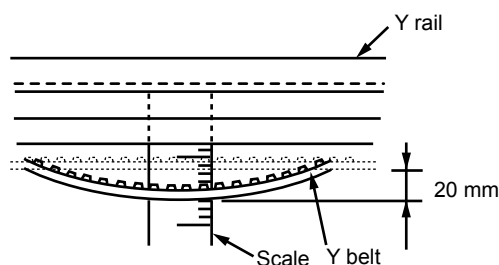
Turn the screws to the right to tighten the belt.

Turn the screws to the left to loosen the belt.



- (3) Check the Y slider belt tension.

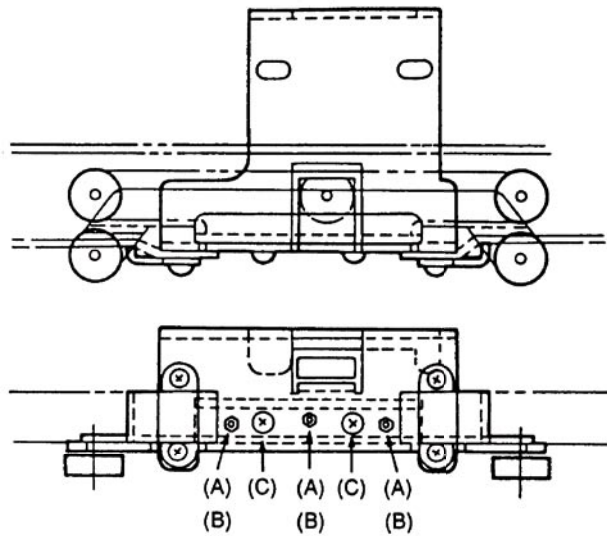
Slide the pen block to the motor side.



- (4) Push down the Y-belt 20 mm from the Y-rail in the center of the Y-belt using a 1 kg push-pull gauge.

The push down force should be from 600 g to 630 g.

7.4 Adjusting the Roller Pressure of the Front X Slider



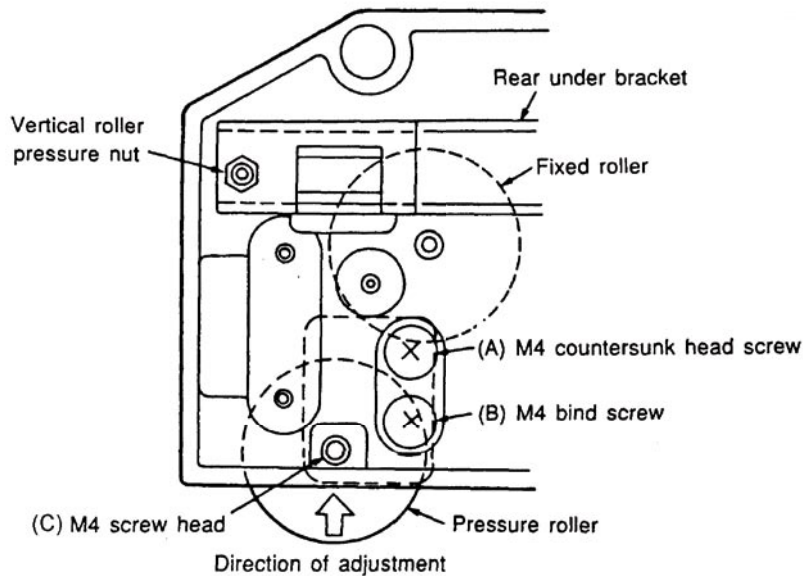
- (1) Insert the front X slider assembly from the right side of the front X rail (the tension adjustment holder side).
- (2) Loosen the two bind screws indicated by (C) by turning them each fully twice, tighten the three M3x6 set-screws in the three taps indicated by (B), then lock the setscrews using M3 nuts at the position where the rollers contact the front X rail.
- (3) Using the three screws indicated by (A), apply pressure to the rollers by adjusting the rollers so that they are parallel to the sliding surface.
- (4) Tighten the two bind screws indicated by (C), and then secure them with adhesive after confirming that the rollers remain in contact with the sliding surface throughout their entire stroke, the sound made by the rollers turning is constantly the same, and the rollers slide smoothly.

NOTES: 1. Visually confirm that each roller is in contact with the sliding surface.

2. After adjusting the roller pressure, the sliding load shall be $35 \text{ gf} \pm 5$.

7.5 Adjusting the Roller Pressure of the Rear X Slider

- (1) Using gauze or a soft cloth moistened with ethyl alcohol, clean the sliding surface of the rear X rail. At this time, confirm the absence of scratches or dents in the sliding surface.
- (2) Loosen the screw of the pressure (adjustable) roller of the rear X slider. When inserting the rear X rail from the belt tension adjustment holder side, take care that the plastic roller is not scratched by the edge of the rear X rail.
- (3) Adjusting the horizontal roller pressure
 - After adjusting the screws indicated by (A) and (B), be sure to lock them in place with adhesive.

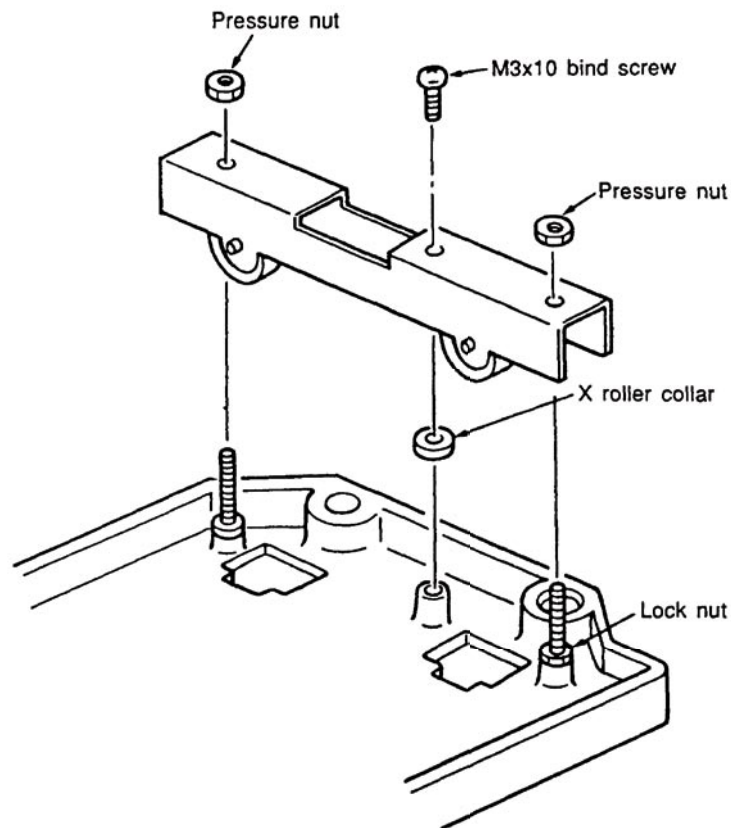


- After tightening screw (A), loosen it by a quarter turn. Use a blade screwdriver to press the screw head (C) in the direction indicated by the arrow, then tighten screws (A) and (B) at the position where the pressure roller contacts the sliding surface of the rear X rail. (Repeat this same procedure for the right roller.)

Confirm that the rollers remain in contact with the sliding surface throughout their entire stroke, the sound made by the rollers turning is constantly the same, and the rollers slide smoothly.

(4) Adjusting the vertical roller pressure

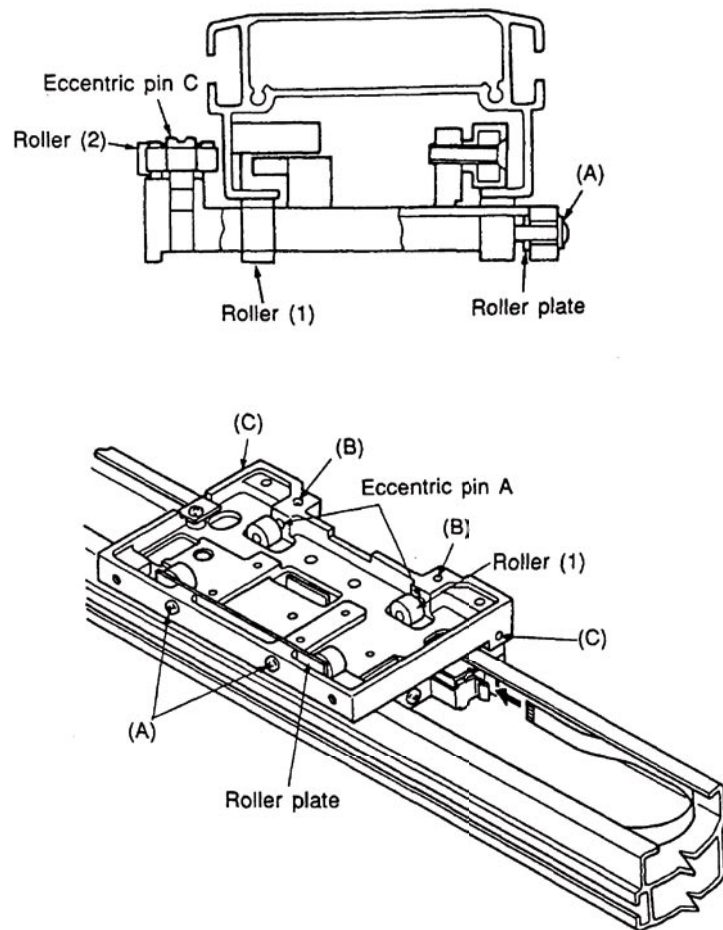
- Use the vertical roller pressure nuts (also shown in the preceding figure) to move the rollers into contact with the sliding surface of the rear X rail, then secure the nuts with adhesive.



NOTES: 1. Confirm the horizontal roller pressure by visually checking that both the fixed and adjustable rollers are in contact with the sliding surface.

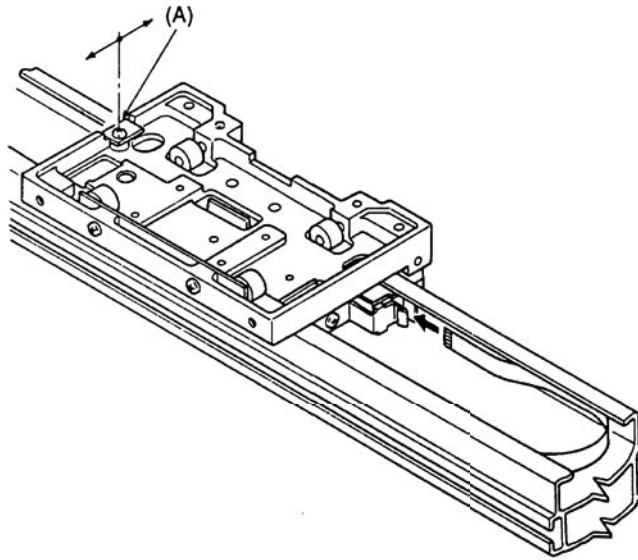
2. After adjusting the roller pressure, the sliding load shall be $35 \text{ gf} \pm 5$.

7.6 Adjusting the Roller Pressure of the Y Slider



- (1) Mounting the Y slider onto the Y bar
 - Loosen the two screws (A), lower the roller plate and temporarily secure it in that position.
 - Loosen the setscrews (B) at the two eccentric pins A, then temporarily secure the roller (1) in a lowered position.
 - Loosen the set-screws (C) at the two eccentric pins C, then move roller (2) outside of the Y slider and temporarily secure it in that position.
- (2) Adjusting the Y slider's roller pressure
 - With the Y slider oriented as shown in the figure above, insert it onto the Y bar, then move each roller back into contact with the sliding surface by performing the steps in (1) above in reverse sequence.
 - Visually confirm that each roller rotates while maintaining contact with the sliding surface. Check that there is no play in the front, back, or side directions.
 - Make sure there are no discrepancies in the "grating" load of the rollers.
 - The sliding load shall be $30 \text{ gf} \pm 5$.
 - After the adjustment is completed, apply adhesive to the four set-screws.

7.7 Adjusting the Position of Sensor Dog Y



Align the sensor dog Y (A) with the center of the Y sensor's slit, then apply adhesive to secure the sensor dog Y in that position.

7.8 Mounting the Y Slider on the Y Flexible Printed Circuit Cable

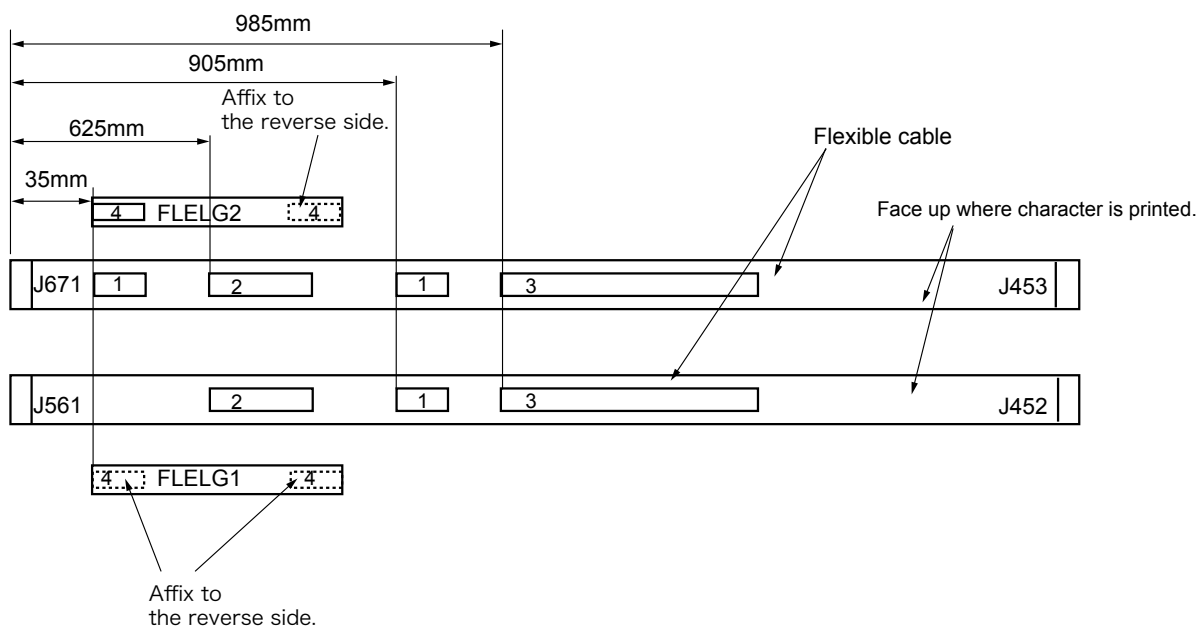
Preparation

Prepare following size of the double-sided adhesive tapes. And affix those pieces of double-sided adhesive tape to the flexible cable and the flexible cable guide as shown in figure below.

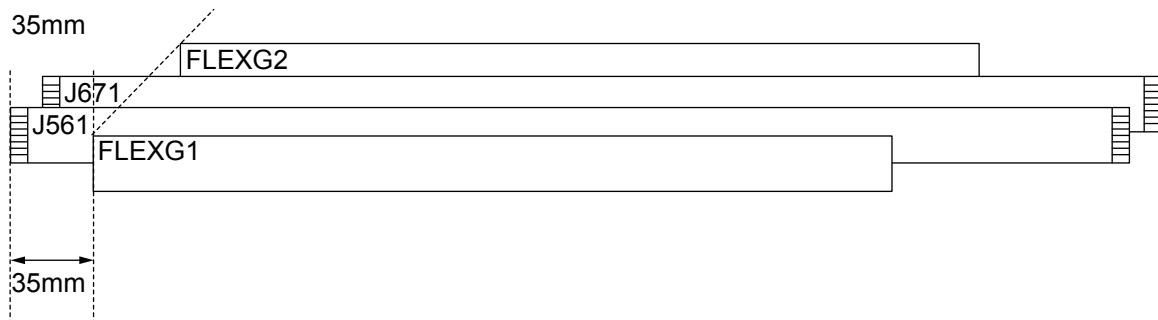
Prepare following size of the double-sided adhesive tapes.

1	10 X 20mm (3)
2	10 X 40mm (2)
3	10 X 200mm (2)
4	5 X 20mm (4)

Affix those pieces of double-sided adhesive tape to the flexible cable and the flexible cable guide as shown in figure below.

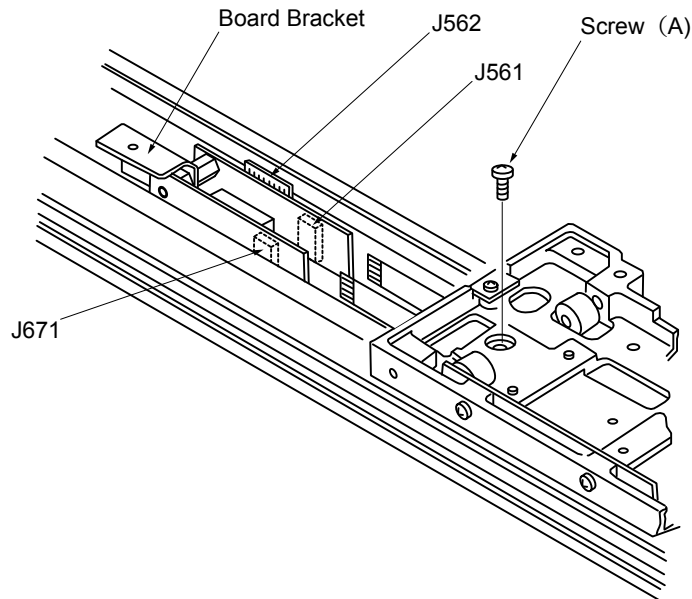


Affix the flexible cable and the flexible guide as shown in figure below.

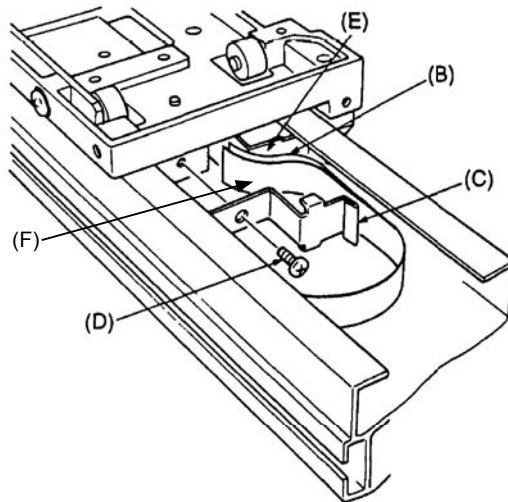


7. DISASSEMBLY AND ADJUSTMENT

- (1) Remove the screw (A) from the board bracket and pull it out as shown in the figure below.



- (2) Pass the two Y flexible printed circuit (FPC) cables through the FPC guide (B) shown in the figure below, then insert the FPC cable into the J561 and J671 connectors.
- (3) Secure the board bracket to the Y slider using the screw which was removed in Step (1) above.

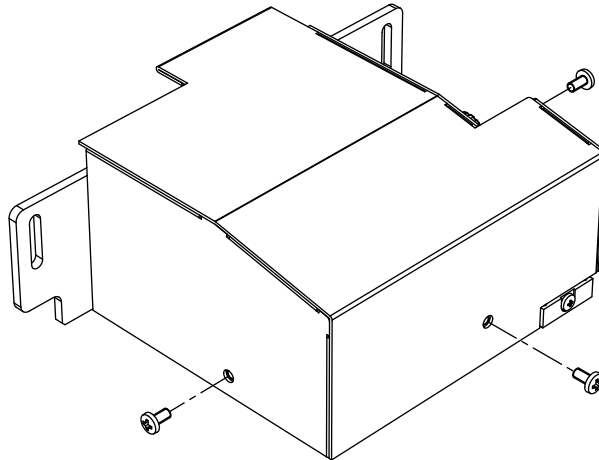


- (4) Pass the Y FPC cable (B) between FPC holder (C) and FPC guide (F), and then secure the cable with a push-fit M3x6 screw (D).
- (5) Apply adhesive to screw (D).

7.9 Pen Block

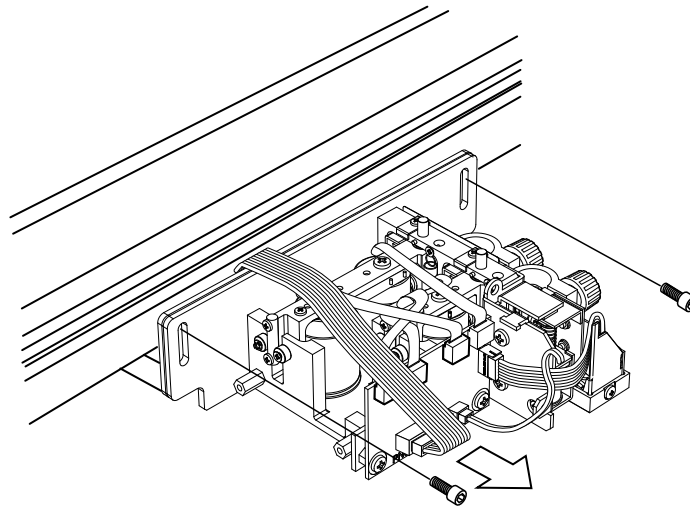
7.9.1 Removing the Pen Block Cover

- (1) Remove the two M3 binding head screws, then lift the cover up.



7.9.2 Removing the Pen Block

- (1) Disconnect the cable from J800 connector on the 2-pen relay board in the direction indicated by the arrow.
- (2) When the two screws are removed, the pen block can be removed.

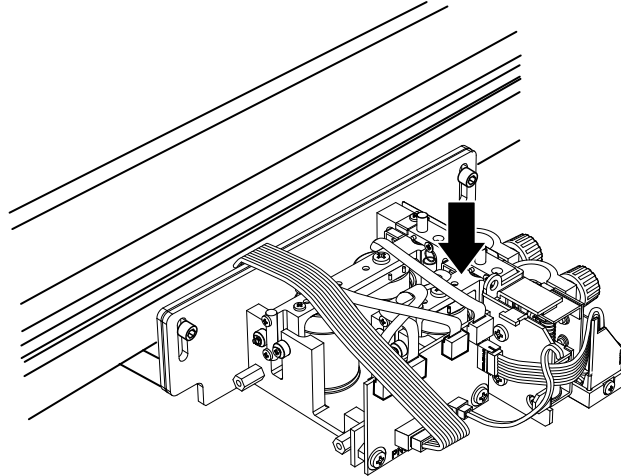


7.9.3 Adjusting the Pen Block

- (1) When a force of 60 gf is applied by a push-pull gauge, the slide arm should lower smoothly to its lowest position.

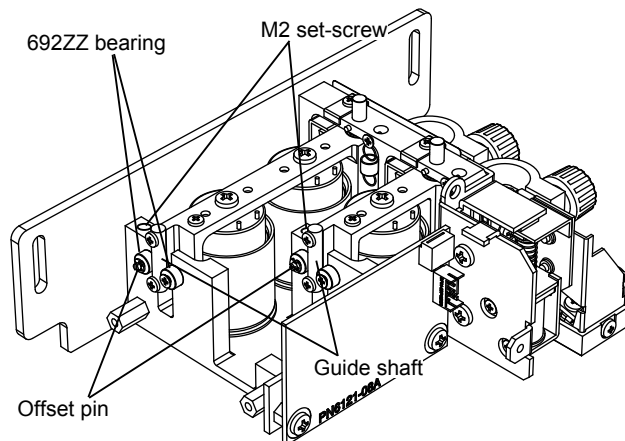
If it does not lower smoothly, the pre-pressure of the 692ZZ bearing against the guide shaft may be too high. Also check for foreign matter on the parts concerned.

When the slide arm is pressed down by hand, it should lower smoothly.



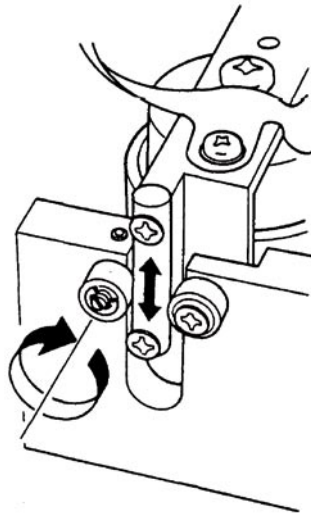
- (2) Perform the adjustment below.

- Loosen the M2 setscrews.
- Turn the offset pins to adjust the 692ZZ bearings to the position where there is no gap.
- Secure with the M2 set-screws.



(3) Checking the guide shaft and bearing adjustment.

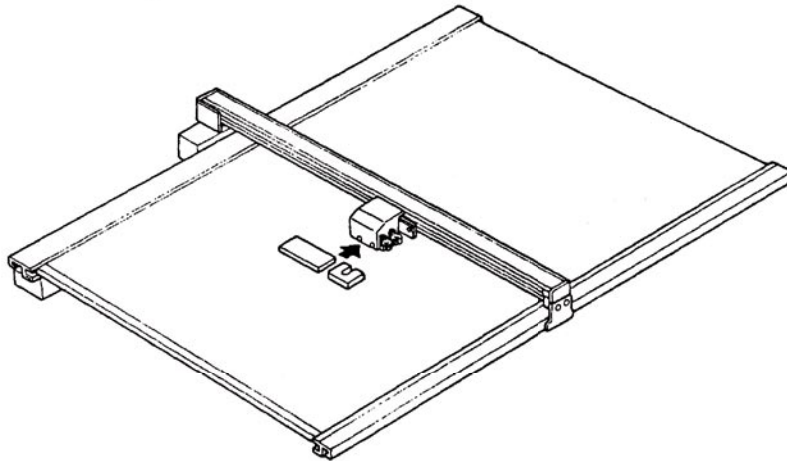
- Raise or lower the guide shaft of the slide arm and confirm that the 692ZZ bearing rotates smoothly.



- If there is still play, there may be play between the guide shaft and 692ZZ bearing of the slide arm.
Replace the pen block assembly.

7.10 Using the Mechanical Adjustment Jigs

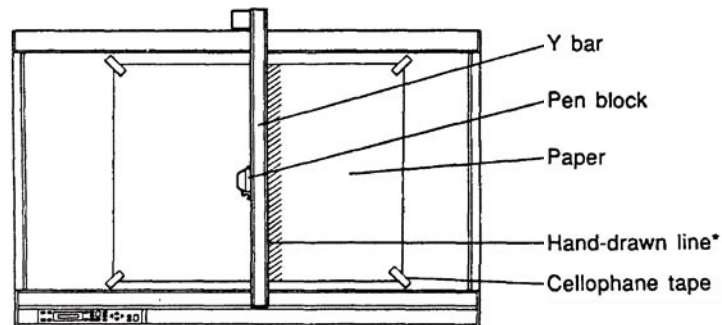
- (1) Pen block height adjustment jig (standard accessory)



7.11 Replacing the Y Bar

7.11.1 Preparations

- (1) Before replacing the Y bar, place a sheet of paper on the writing panel and secure it with cellophane tape.
- (2) Move the Y bar to the center of the paper and lower the pen to manually draw a line down the length of the bar.



* This line will serve as a guideline for determining perpendicularity after the Y bar is remounted.

7.11.2 Replacing the Y Bar

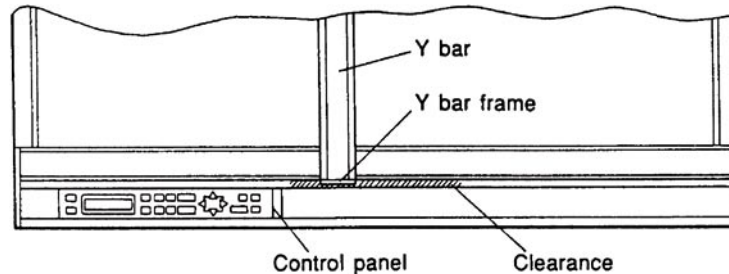
Make sure that the plotter is turned off.

- (1) Remove the pen block which is attached to the Y bar.
- (2) Remove the Y bar.
 - Temporarily attach the Y bar along the line drawn in Step (2) of subsection 7.11.1, "Preparations."
 - Adjust the Y bar height from the front frame and rear frame to 31.5 mm.
 - Adjust the Y bar frame clearance from the control panel frame to 2 mm.
- (3) Attach a new Y bar.
 - Temporarily attach the Y bar along the line drawn in Step (2) of subsection 7.11.1, "Preparations."
 - Adjust the Y bar height from the front frame and rear frame to 31.5 mm.
 - Adjust the Y bar frame clearance from the control panel frame to 2 mm.
- (4) Mount the pen block, which was removed in Step (1) above, onto the new Y bar.
 - After using the pen block adjustment jig to adjust the height of the pen block, secure the pen block in place.

NOTE: When the Y bar is moved manually from side to side while the plotter is turned off, be sure to detach the three connectors which connect the control box to the plotter's main unit. Failure to remove these connectors may cause the gears to slip or not mesh properly.

7.11.3 Checking the Sliding of the Y Bar Frame (Manual Check)

- (1) Adjust the clearance 2 mm at the front of the Y bar frame to confirm that the frame clearance is approximately identical at the front and rear of the writing panel. While moving the Y bar in the X-axis direction, make sure that no abnormal sound is generated as a result of the Y bar making contact with the Y bar frame.



- (2) Other adjustments of the Y bar frame
- Loosen the screw located on the bottom plate of the control panel, then pull the control panel assembly toward you to increase the clearance.
 - When the front and back clearances of the Y bar frame are identical, readjust the height of the Y bar.
 - After adjustment, gently slide the Y bar within its movable range to confirm that no abnormal sound is generated.

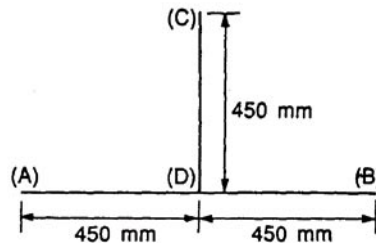
NOTE: Before moving the Y bar by hand, be sure to detach the three connectors which connect the control box to the plotter's main unit.

- Next, re-connect the three connectors, turn on the plotter, and use the POSITION keys to check the operation of the Y bar within the effective plotting area.

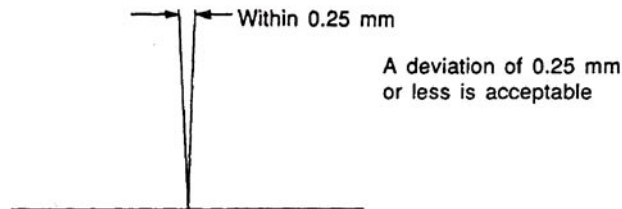
7.12 Adjusting the Perpendicularity Precision

7.12.1 Checking the Deviation in the Perpendicularity

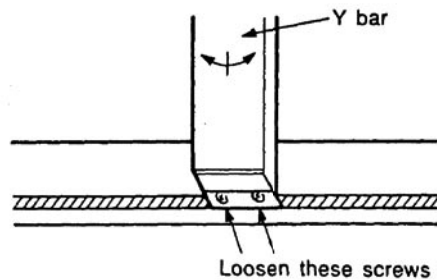
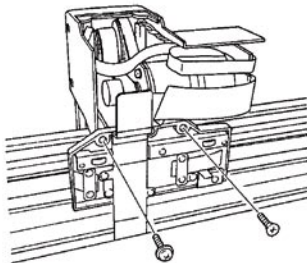
- (1) Load a thin sheet of paper on the writing panel and attach a plotter pen (0.2 mm ceramic pen) to the No.1 pen holder.
- (2) Manually move the pen to plot the pattern shown in the figure below.



- (3) Turn the sheet over and load it so that points (A) and (B) on the other side are parallel to the X axis.
- (4) After positioning the pen on point (D), draw a line to point (C). Check if there is any deviation between the lines between points (D) and (C) on the front and back of the sheet.



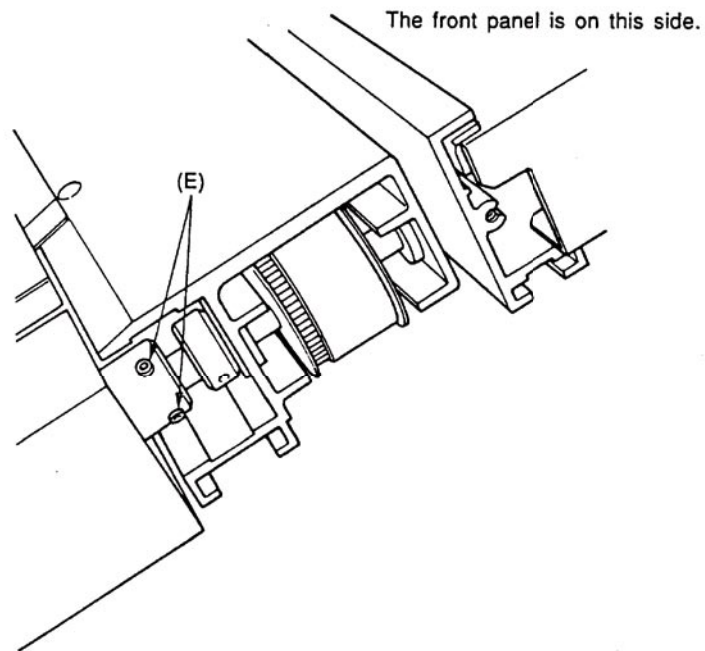
- (5) If the deviation exceeds 0.25 mm, loosen the screws at the top and bottom of the Y bar and adjust the vertical orientation of the Y bar by moving it toward the pertinent side.



- (6) Repeat Steps (1) to (4) above to confirm the precision of the perpendicularity.

7. DISASSEMBLY AND ADJUSTMENT

- (7) If the perpendicularity cannot be satisfactorily adjusted by performing the preceding Steps (1) to (6), repeat adjustment after loosening the two 3 mm setscrews indicated by the (E) arrows.



- (8) You will be able to adjust the perpendicularity precision by performing the electrical adjustment for fine adjustment. (See section 8.12 Adjusting the Distance and the Perpendicularity Accuracy.)

7.13 Replacing the Electrostatic Adhesion Plate

(This operation requires three persons.)

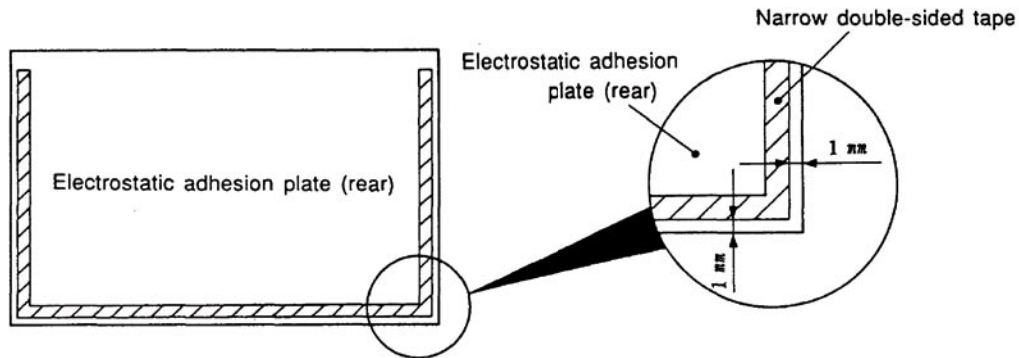
7.13.1 Peeling Off the Electrostatic Adhesion Plate

- (1) Turn off the power and remove the high-voltage power supply cable connectors (P34 and J34) at the rear of the writing panel.
- (2) Remove the Y bar. (See section 7.3, "Adjusting the Y slider".)
- (3) Cut into the electrostatic adhesion plate at intervals (50-100 mm) that will make it easy to peel off the electrostatic adhesion plate. If this scratches the aluminum plate underneath, polish away the unevenness with #1500 sandpaper.
- (4) Peel off the electrostatic adhesion plate, using force if necessary. Using pliers or the like makes it easy.
- (5) Remove any remaining double-sided tape and glue. Sprinkle on ECT-1 toner cleaning fluid (available from Graphtec) and leave for 1 or 2 minutes. Scrape off with some sort of scraper (e.g. spatula).
- (6) When everything has been removed from the aluminum plate, wipe it off with ethyl alcohol.

7.13.2 Preliminary Preparations for Pasting On New Plate

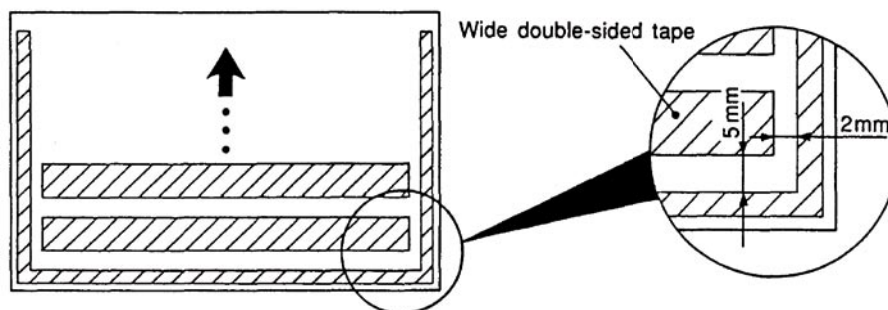
- (1) Wipe off the front and rear surfaces of the electrostatic adhesion plate with ethyl alcohol to remove any dirt and dust.
- (2) Prepare pieces of double-sided tape of various widths* and paste them on to the rear surface of the electrostatic adhesion plate following the procedure below.
 - Using narrow double-sided tape, make a border around three sides of the electrostatic adhesion plate (leaving one of the longer sides untaped).

(Leave 1 mm open between the tape and the edge of the electrostatic adhesion plate.)



NOTE: Never let the tape overlap!

- * "Pieces of double-sided tape of various widths" means tape of 120, 20, 10, 5 mm width at the production stage. If it is difficult to prepare pieces of tape of these widths, use double-sided tape as close to these widths as possible.
- Tape on lengthwise strips of wide double-sided tape at intervals of 5 mm.



NOTE: Never let the tape overlap!

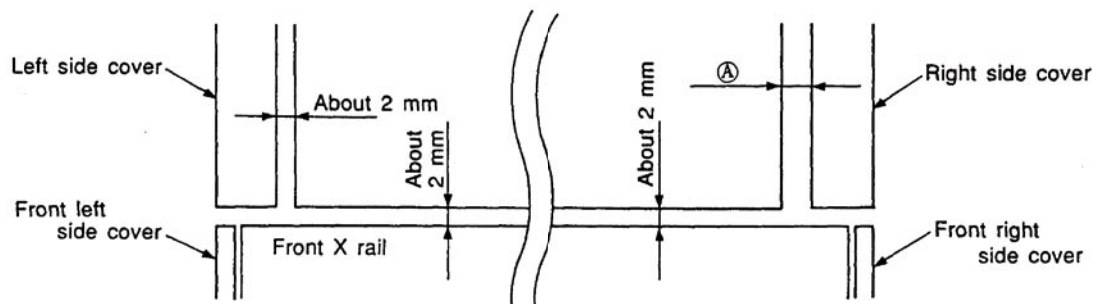
Tape on the double-sided tape in such a way that the gap is as negligible as possible at the high-voltage power supply cable installation section.

- Finally, use a combination of wide and narrow double-sided tape so that there is no untaped interval greater than 5 mm.

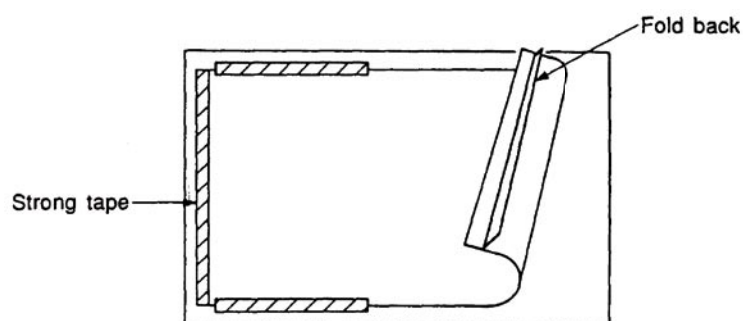
NOTE: Never let the tape overlap!

7.13.3 Attaching the Electrostatic Adhesion Plate

- (1) Temporarily fasten the side cover, line up the holes for the high-voltage power supply cable on the writing panel and the electrostatic adhesion plate and position according to the following conditions.
 - Use the origin side (front X rail side and left side cover side) as the reference.
 - Position about 2 mm from the origin side as in the figure below.



- Since there are slight differences in the size of electrostatic adhesion plates, the dimensions are not specified with great precision.
 - “A” in the diagram above is not 2 mm.
 - Be careful not to let any dirt or dust get under the electrostatic adhesion plate during positioning.
- (2) Secure the origin side with strong tape.
 - (3) Peel off and fold back the backing sheet of the double-sided tape at the high-voltage power supply cable side for about 100 mm and paste on without letting in any dirt, dust, or air.

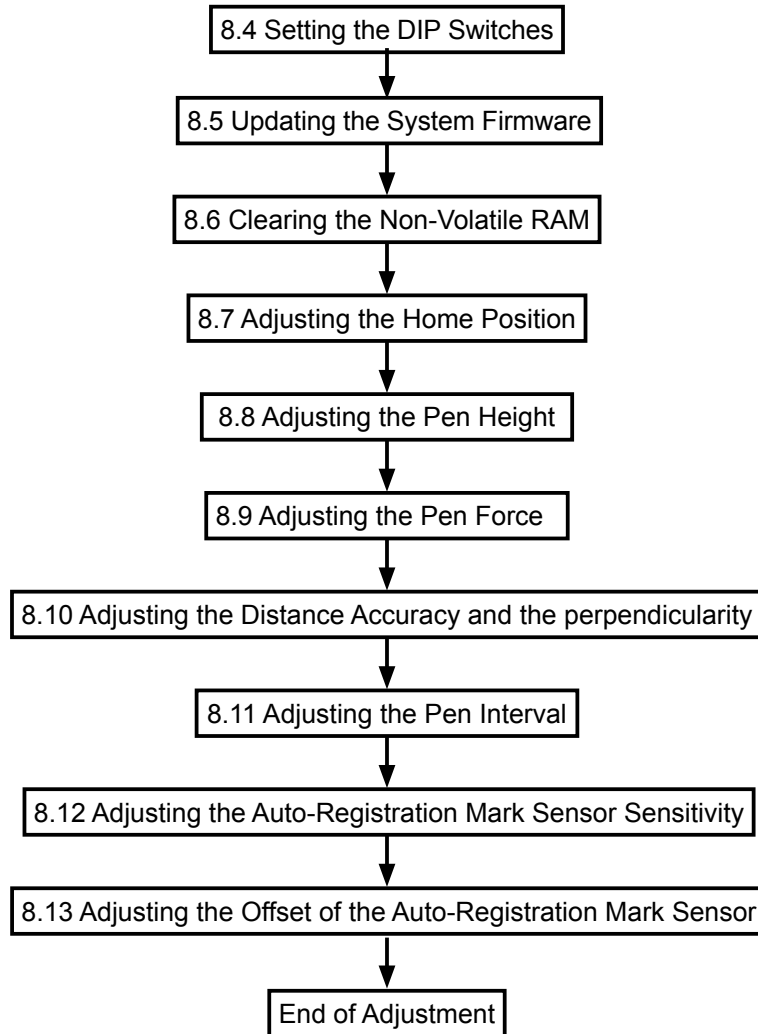


- (4) Peel off the strong tape used for securing in Step (1) above, and while one person holds the origin side and checks for and points out any unevenness, the other two persons peel off the double-sided tape backing sheet and paste on by sliding their hands along.
 - If dust or dirt gets in, remove it with tweezers or your fingernail tips.
 - If air gets in, drive out the air at 5 mm intervals by kneading softly.
- (5) When the entire surface has been spread out, attach it by sliding your hand across it again and pressing it.

8. ELECTRICAL ADJUSTMENTS

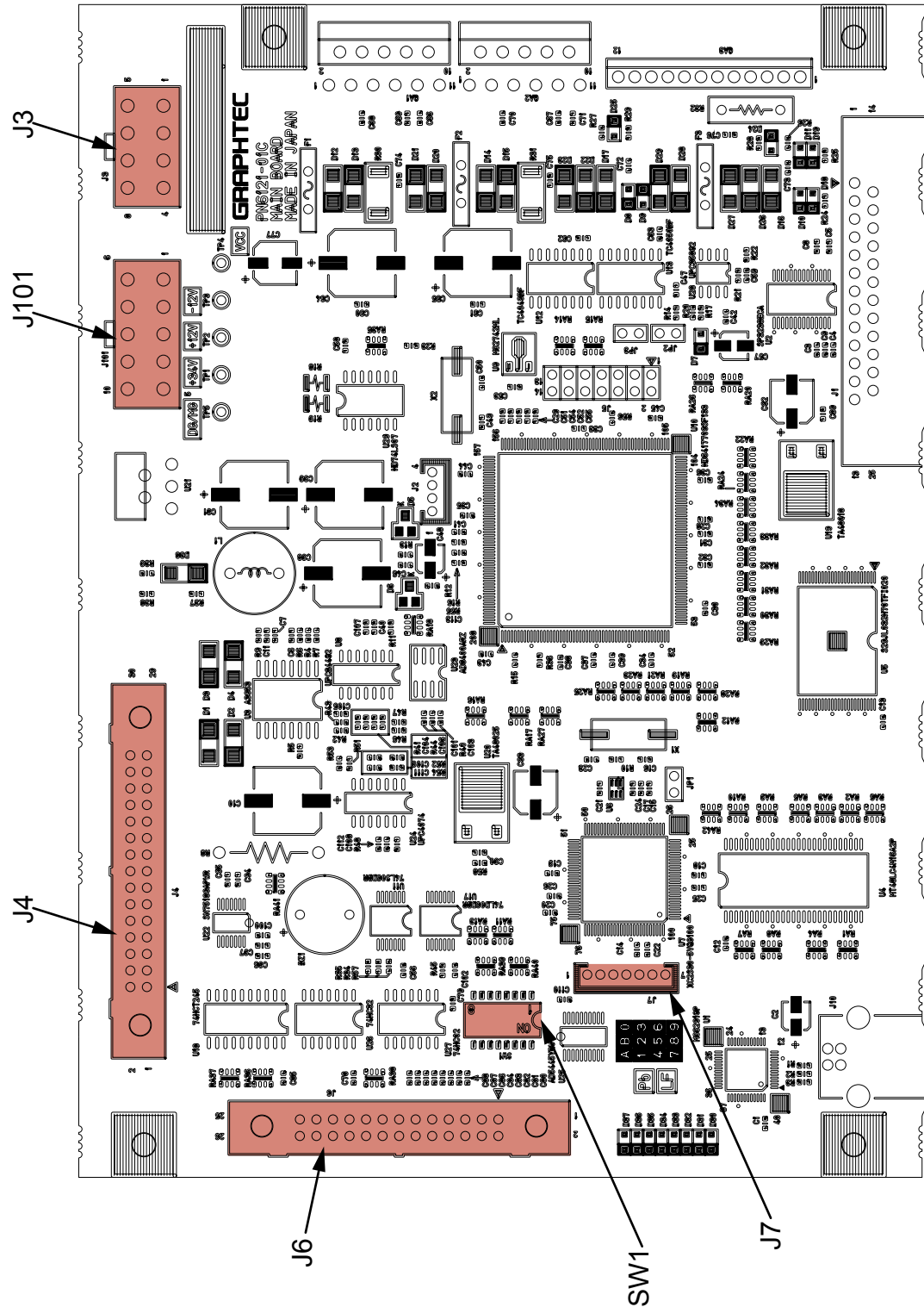
8.1 Flowchart of the Adjustment Sequence

Flowchart of the Adjustment Sequence for the FC2250 series.



8.2 Location of the Boards

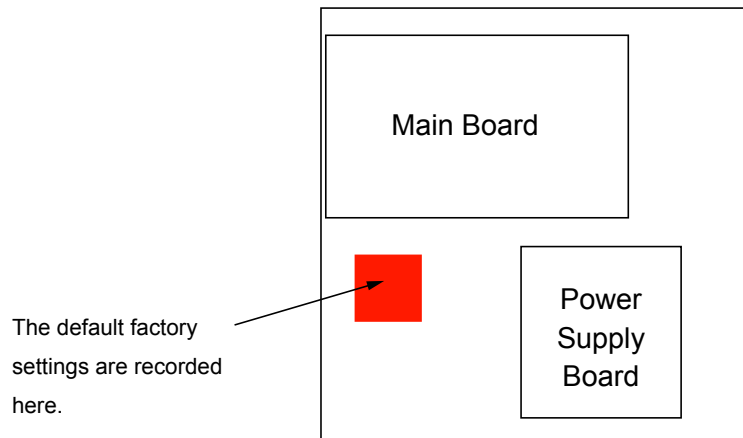
8.2.1 Main Board (PN6121-01C)



8.3 Explanation of the Values of the Main Board

Default factory settings

The default factory settings are recorded in the location shown below.



The contents of an example are shown below.

PEN1 88, 424, 732

PEN2 89, 424, 772, 1030, 1533

X=+10 Y=0 D=860.00

Explanation of the values

Pen force values					
PEN1	24g	210g	400g	-	-
PEN2	24g	210g	400g	700g	1000g
Distance adjustment values					
X	Y	D			

You can input the same values when you have replaced the main board without making any adjustments except the pen height, home position and pen interval adjustments.

If you have changed any values by making adjustments, record those values for the next maintenance check.

8.4 Setting the DIP Switches

Settings for the DIP Switch on the Main Board

DIP Switch Factory Settings (Normal mode)



NOVRAM CLEAR Function mode

Set bits 2, 3, 5, 6 and 7 to ON



- Initialize the main board by clearing the non-volatile RAM
- Execute this function before starting any electrical adjustment

Electrical Adjustments

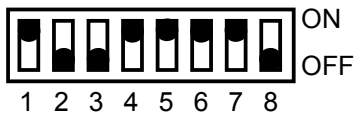
Set bits 4, 5, and 6 to OFF



- Pen height adjustment
- Pen force adjustment
- Distance adjustment
- Home position adjustment

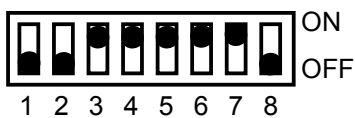
Gain Adjustment

Set bits 2, 3 and 8 to OFF



Keyboard and Sensor Test Mode

Set all bits to OFF



8.5 Updating the System Firmware

To update the system firmware you need to have the following files. In addition, you need to use a computer and USB cable or Centronics cable.

Firmware :FC2250

SEND.EXE :Utility to transfer files using Windows

OPS662 :USB Driver software for the FC2250 (when using USB to update the firmware)

- (1) Check that the power supply and control panel unit are connected to the main board.

Connect a personal computer to the USB terminal.

Caution: If you are writing to a new board for the first time, remove the motor and flex cable connectors before performing the write function.

- (2) Set the DIP switch to "Normal mode".
- (3) Hold down both the "Right" and "Left" POSITION keys while turning on the power. When you hear a short buzzer tone, release the keys. The LCD should display the following:

UPDATE FIRMWARE ?	
YES	NO

- (3) Press the [F2] key, and the LCD will display the following:

UPDATING FIRMWAER
DO NOT SWITCH OFF

The LCD screen changes to display the following:

PLEASE SEND PROGRAM!
USB

- (4) Transfer firmware data from the personal computer.

Send firmware to the plotter from the computer.

Drag and drop the firmware file onto the SEND.EXE icon when using Windows.

The LCD screen changes to display the following:

PROGRAM RECEIVING
** KB COMPLETE

Number of bytes transferred

As the firmware data is successfully transferred, the number of transferred bytes shown on the LCD increases. When the transfer is completed, the display automatically changes to "FLASH MEMORY CLEAR" and "FLASH MEMORY WRITE," and the system begins writing to flash memory.

Note:

If you are writing to a new board, the system will automatically perform a NOVRAM clear operation following the write function.

- (5) Turn off the plotter when the message below appears.

COMPLETED
POWER OFF THEN ON!

8.6 Clearing the Non-Volatile RAM

NOTE: Be sure to clear the non-volatile RAM after replacing the main board or before starting any electrical adjustment.

- (1) After setting the SW1 DIP switch as shown below, turn on the plotter.

Set bits 1, 4 and 8 to OFF



- (2) The messages below consecutively appear on the LCD panel.

NOVRAM CLEARE START

- (3) The messages below consecutively appear on the LCD panel.

SELECT MODEL
FC2250-60-****

- (4) Select your plotter model using the $\triangle$ and ∇ keys, and then press the ENTER key to register your plotter model setting.

FC2250-180-*2

FC2250-120-*2

FC2250-60-*2

- (5) The message below appears. Press the $\triangle$ and ∇ key to switch through the standards. Select the standard that matches the version displayed when the plotter was shipped, and then press the ENTER key to register your plotter standard setting.

SET SUFFIX
STD [V 1.00]

- (6) After the “NOVRAM CLEAR END” message is displayed as shown below, turn off the plotter and then return the DIP switch to its normal settings.

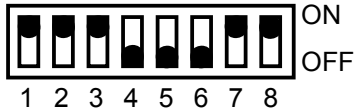
NOVRAM CLEARE END

NOTE: Clearing the non-volatile RAM initializes the pen height adjustment, distance accuracy adjustment, and other settings to their respective default values.

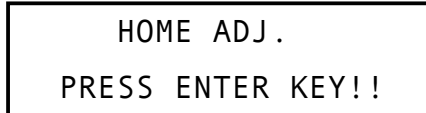
8.7 Adjusting the Home Position

- (1) Set the SW1 DIP switch as shown below and then turn on the plotter.

Set bits 4, 5, and 6 to OFF



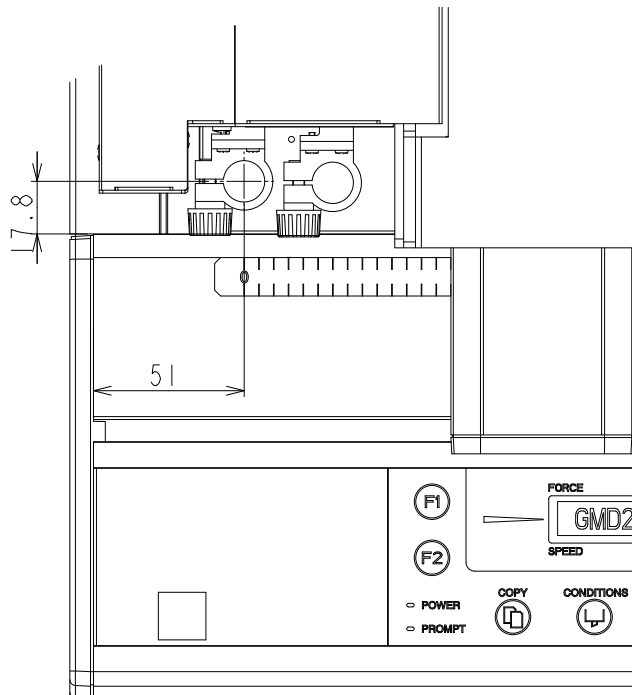
- (2) Press the [NEXT] key until the LCD displays the following:



- (3) Press the [Enter] key. The plotter starts reading the home position. The LCD screen changes to display the following:



- (4) Attach a pen-type magnifier to the No.1 pen holder, and then move it to the home position as shown in the figure below using the POSITION keys. After confirming the position, press the [Enter] key.



- (5) The plotter starts reading the home position again and then returns to the new home position specified in step (3). If the position is correct, press the [ENTER] key to finish.
- (6) Turn off the plotter and then return the DIP switch to its normal settings, or press [NEXT] key to proceed to the next adjustment.

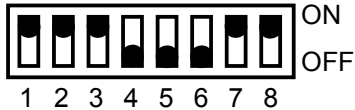
(This adjustment does not affect the plotter's pen exchange adjustment.)

8.8 Adjusting the Pen Height

- Note:**
- Before starting the pen height adjustment, make sure that there is no pen or cutter attached to the pen holder.
 - To avoid malfunction of the pen holder, do not touch the pen holder during adjustment.
 - Make sure that the pen holder is not in contact with the pen block cover.

- (1) Set the SW1 DIP switch as shown below and then turn on the plotter.

Set Bits 4, 5, and 6 to OFF



- (2) A menu for electrical adjustment appears on the LCD panel.
 (3) Press the [NEXT] key until the LCD displays the following:

```

  PEN HEIGHT
  PRESS ENTER KEY!!
  
```

- (4) Press the [Enter] key. The LCD screen changes to display the following:

```

<AUTO ADJ
<DEFAULT      POWER>
  
```

- (5) Press the [F1] (AUTO ADJ) key.

After the message below appears, the plotter automatically adjusts the pen height for the No.1 and No.2 pens.

The beeper sounds twice after adjustment for the No.1 pen has been completed, and then the plotter automatically adjusts the pen height for the No.2 pen.

```

  No.1 PEN HEIGHT
  C0 A=000 0=300 G=500
  
```

```

  No.2 PEN HEIGHT
  C0 A=000 0=300 G=500
  
```

- (6) When adjustment is completed, turn off the plotter and then return the DIP switch to its default settings or press the [NEXT] key to proceed to the next adjustment.
 (7) Be sure to perform this adjustment whenever the pen block has been replaced.

8.9 Adjusting the Pen Force

Required jigs and tools

- Colex gauges (500 g, 300 g, 50 g)
- Push/Pull gauge (1 kg)
- Cutter plunger

(1) Check that the carriage cover is in place. Fit a cutter plunger from which the blade has been removed into the cutter holder.

(2) Set the SW1 DIP switch as shown below and then turn on the plotter.

Set Bits 4, 5, and 6 to OFF



(3) A menu for electrical adjustment appears on the LCD panel.

(4) Press the [NEXT] key until the LCD displays the following:

```
PEN PRESS ADJUST
PRESS ENTER KEY!!
```

(5) Press the [ENTER] key to display the following menu.

```
PEN PRESS ADJUST
AUTO          MANUAL
```

(6) Press the [F4] key. The LCD screen changes to display the following:

```
PEN PRESS SETTING
No. 1  ->  24 [g]
```

(7) Press the [Enter] key. When the LCD screen changes to display the following, measure the pen pressure with a Colex gauge. Use the [F1] through [F4] keys to adjust the pen pressure until the pressure is within 24 ± 1 g. After adjustment, press the [Enter] key to go to the next step. If you have only replaced the main board, input the adjustment values that were recorded.

Target pen pressure

```

+1      24g      -1
+10     *****  -10
```

Correction value

The diagram shows a target pen pressure of 24g. Below it, a correction value is shown as a range from +1 to -1 (small adjustment) and +10 to -10 (large adjustment). The correction value is indicated by an arrow pointing to the correction value field.

[F1] key: Increases pen pressure by a small amount.

[F2] key: Increases pen pressure by a large amount.

[F3] key: Reduces pen pressure by a small amount.

[F4] key: Reduces pen pressure by a large amount.

(8) Next, when the LCD display changes to the 210 g setup screen, adjust the pen pressure to within 210 ± 10 g in the same way as described above.

8. ELECTRICAL ADJUSTMENTS

- (9) Next, on the 400 g setup screen, adjust the pen pressure to within 400 ± 20 g.
- (10) The adjustment menus for the No.2 pen will be displayed after you have finished the adjustments for the No.1 pen.

Adjust the pen pressure for the No.2 pen in the same way as you did for the No.1 pen.

- (11) Proceed to the adjustments for the 24 g to the 1000 g.
- (12) When the adjustments have been completed for the No.2 pen, the LCD display returns to the 24 g screen for the No.1 pen. At this screen, either press the [NEXT] key to proceed to the next adjustment, or turn off the plotter to exit the adjustment menu and then return the DIP switch to its normal settings.

NOTE: After you have changed the numeric value on the LCD, press the F3 key (PEN U/D) to raise and lower the cutter before measuring the pen force again.

When the measured pen force is the specified value, press the ENTER key. The next specified pen force appears on the LCD panel.

Repeat the above procedure in the following sequence.

	No.1 pen pressure	No.2 pen pressure
24	24 g $\pm$ 1 g	24 g $\pm$ 1 g
210	210 g $\pm$ 10 g	210 g $\pm$ 10 g
400	400 g $\pm$ 20 g	400 g $\pm$ 20 g
700	N/A	700 g $\pm$ 30 g
1000	N/A	1000 g $\pm$ 50 g

8.10 Adjusting the Distance and the Perpendicularity Accuracy

This adjustment will set the distance and the perpendicularity accuracy.

If you replace the main board or clear the Non-Volatile RAM, use the following procedure to input the recorded adjustment values.

How to adjust the distance accuracy

- (1) Mount a ceramic pen (0.2 mm tip size) in the No.1 pen holder.
- (2) Load a sheet of A1 or A2 size paper in the plotter.
- (3) Set the DIP switch to the adjustment mode as shown below.

Electrical Adjustments

Set bits 4, 5, and 6 to OFF



- (4) Turn on the power to the plotter.
- (5) Press the [NEXT] key until the following menu is displayed.

```
DIST. ADJ. (0.01mm)
PRESS ENTER KEY !!
```

- (6) Press the [Enter] key to display the menu shown below.

```
SEL SIZE      300x300
200x200      500x700■
```

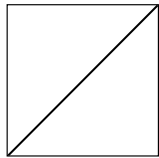
- (7) Press the [F4] key to select the 500x700 mm adjustment pattern.
(Press the [F2] key to select the 300x300 mm adjustment pattern when you are adjusting the FC2250-60.)
- (8) Press the [Enter] key to display the menu shown below.

```
<ORIGINAL      CLEAR>
<ADJ. DRAW     INPUT>
```

- | | |
|--------------------|--|
| F1 key (ORIGINAL) | :Draw the test pattern without distance adjustment. |
| F2 key (ADJ. DRAW) | :Draw the test pattern with distance adjustment. |
| F3 key (CLEAR) | :Clear the distance adjustment value. |
| F4 key (INPUT) | :Move to the distance adjustment value setting menu. |

- (9) Press the [F1] key to start the test. The plotter immediately plots the test pattern, and the following menu appears.

DIST. ADJ. (0.01mm)	
X = +10	Y = -10



X=500 (300) mm

Y=700 (300) mm

- (10) Remove the paper and measure the X-axis distance, Y-axis distance and the diagonal distance. If you have replaced the main board only, use the recorded values.

- (11) Input the axis adjustment values using the F1 to F4 keys.

Press the [F1] or [F2] key to change the X-axis adjustment value.

Press the [F3] or [F4] key to change the Y-axis adjustment value.

The formula of the input value is as follows (FC2250-120/180):

Input value for X-axis = (500 mm - measured distance) x 10

Input value for Y-axis = (700 mm - measured distance) x 10

For example:

If you measured 499.7 mm for the X-axis, input 30 for the adjustment value.

Press the [F1] key to select the +0.1-mm step unit.

- (12) Press the ENTER key to display the menu shown below.

+0.1	X-Y LENG	-0.1
+0.01	L=860.23	-0.01

[F1] key (+0.1) :Increase the diagonal distance value in 0.1-mm steps.

[F2] key (+0.01) :Increase the diagonal distance value in 0.01-mm steps.

[F3] key (-0.1) :Decrease the diagonal distance value in 0.1-mm steps.

[F4] key (-0.01) :Decrease the diagonal distance value in 0.01-mm steps.

- (13) Input the diagonal adjustment values using the [F1] to [F4] keys.

The displayed L value is the diagonal distance.

If the measured value is within the displayed L value of the specification range (± 0.1 mm) or if you have input the recorded value, press the [ENTER] key to store the setting.

- (14) The following menu appears.

<ORIGINAL	CLEAR>
<ADJ. DRAW	INPUT>

(15) If you have changed the diagonal distance value, confirm the axis distance.

Load a new sheet of paper and press the [F2] key to draw the adjusted test pattern.

Measure each distance. If the measured values are within the specification range, press the [ENTER] key to store the setting.

Specification range for the X distance = 500 mm $\pm$ 0.2 mm.

Specification range for the Y distance = 700 mm $\pm$ 0.2 mm.

Specification range for the diagonal distance = within 0.1 mm from the displayed L value.

If the measured value is outside the specification range, adjust again from step (6).

(16) When the adjustment is complete, turn off the power to the plotter.

(17) Return the DIP switch to its default settings (see subsection 8.4 "Setting the DIP Switches").

8.11 Adjusting the Pen Interval

This enables adjustment of the distance between the origins for Pen 1 and Pen 2.

Note: Pens are used to draw lines for this adjustment. As described below, mount pens in the Pen 1 and Pen 2 positions, then specify their conditions.

Procedure

- (1) Load a medium that is suitable for plotting.
- (2) Mount pens in the Pen 1 and Pen 2 positions.
- (3) Press the PAUSE key to select PAUSE mode.
- (4) Press the [NEXT] key repeatedly until the following menu is displayed.

```

◀I / F      FUNCTION▶
◀TOOL COND AREA OPT▶
  
```

- (5) Press the [F2] key (TOOL COND) to display the menu shown below.

```

◀THICK      CUT LINE▶
◀TOOL No.  ADJ.T POS▶
  
```

- (6) Press the [F4] key (ADJ.T POS) to display the menu shown below.

```

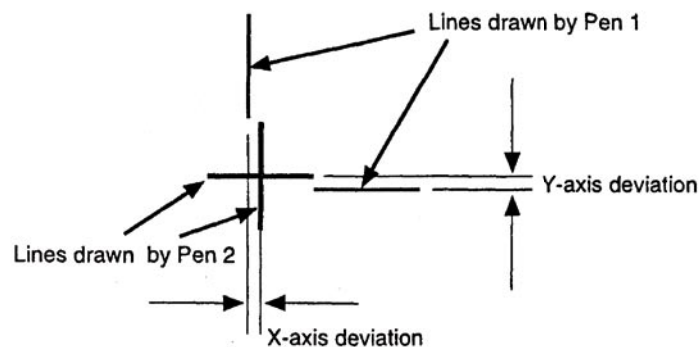
      TOOL WIDTH ADJ.
X=  0.0mm  Y=  0.0mm
  
```

- (7) Press the [TEST] key to display the menu shown below.

```

      SELECT PLOT POINT
      PRESS ENTER KEY!
  
```

Use the position keys to move the pen carriage (the tip of the tool selected by the current setting) to the position where you want to draw the test pattern. Press the [ENTER] key. The plotter will start drawing the following test pattern.



- (8) Adjust the deviation of Pen 1 based on the lines drawn by Pen 2.
 To adjust the X-axis deviation, press the [F2] key and then use the $\triangle$ and ∇ keys to adjust the numeric value.
 To adjust the Y-axis deviation, press the [F4] key and then use the $\triangle$ and ∇ keys to adjust the numeric value.
 The X= and Y= values can be specified in a range of -8.0 to +8.0 mm.

(9) Press the ENTER key to register your INTERVAL ADJUST setting.

(10) Press the PAUSE key to cancel PAUSE mode, and the turn off the plotter.

Note: Your INTERVAL ADJUST setting is retained in the plotter's internal memory even while the plotter is turned off.

8.12 Adjusting the Auto-Registration Mark Sensor Sensitivity

- (1) Set the SW1 DIP switch as shown below and then turn on the plotter.

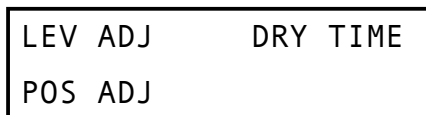
Set bits 4, 5, and 6 to OFF



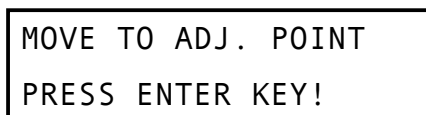
- (2) Press the [NEXT] key until the LCD displays the following:



- (3) Place white paper for adjustment use on the panel, making sure that no part of it is raised above the surface. The paper color must be white, and it is recommended that high-quality paper made for ink-jet printers be used.
- (4) Press the ENTER key to display the menu shown below.

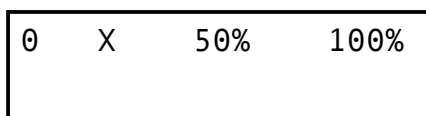


- (5) Press the [F1] key to display the menu shown below.

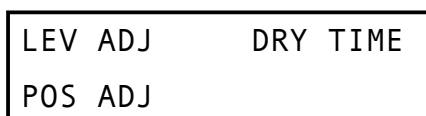


Move the mark sensor by the position keys to the position exactly above the paper.

- (6) Press the ENTER key to start the registration mark sensor gain adjustment. The plotter immediately adjusts the registration mark sensor gain automatically.



- (7) The plotter displays the menu shown below when this adjustment has been completed.



- (8) Turn off the power to exit from the adjustment menu.

8.13 Adjusting the Offset of the Auto-Registration Mark Sensor

- (1) Set the SW1 DIP switch as shown below and then turn on the plotter.

Set bits 4, 5, and 6 to OFF



- (2) Set the plotting conditions to the following settings:
Force: 12, Speed: 40, Quality: 1, Tool: Pen
- (3) Mount a disposable ink pen (0.2 mm tip size) in the pen holder 1.
- (4) Press the [NEXT] key until the LCD displays the following:

MARK ADJUST
PRESS ENTER KEY!!

- (5) Place white paper for adjustment use on the panel, making sure that no part of it is raised above the surface. The paper color must be white, and it is recommended that high-quality paper made for ink-jet printers be used.
- (6) Press the ENTER key to display the menu shown below.

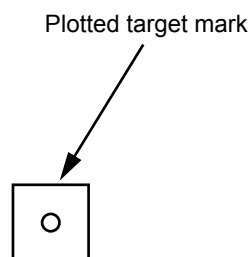
LEV ADJ DRY TIME
POS ADJ

- (7) Press the F2 key to display the menu shown below.

MOVE TO ADJ. POINT
PRESS ENTER KEY!

Move the mark sensor by the position keys to the position exactly above the paper.

- (8) Press the ENTER key to plot the adjustment pattern shown below.



- (9) The plotter immediately adjusts the registration mark sensor position automatically.
- (10) The plotter displays the menu shown below when this adjustment has been completed.

LEV ADJ DRY TIME
POS ADJ

If the sensor can not scanned the plotted pattern the LCD displays the following:

SENSOR ERROR

When the LCD displays error above;

Replace the pen to draw the adjustment pattern completely, and then retry the adjustment.

If the plotted pattern is not dried yet when scanning set the DRY time.

LEV ADJ	DRY TIME
POS ADJ	

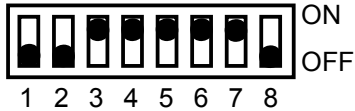
(11) Turn off the power to exit from the adjustment menu.

8.14 Testing the Control Panel Keys and Home Sensors

Run this test if a control panel key or home sensor has malfunctioned.

- (1) Set the SW1 DIP switch as shown below and then turn on the plotter.

Set bits 1, 2, and 8 to OFF



- (2) The menu below appears, so press the panel key corresponding to each bit and check that its value properly changes to the corresponding character or 0.

KEY & SNS TEST MODE
OPCERLUD00TN4321XY

Press each key on the control panel; the status will change as shown below.

Key	Status of LCD																	
	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
RIGHT ARROW	0	0	0	0	R	0	0	0	0	0	0	0	0	0	0	0	0	0
DOWN ARROW	0	0	0	0	0	0	0	D	0	0	0	0	0	0	0	0	0	0
UP ARROW	0	0	0	0	0	0	U	0	0	0	0	0	0	0	0	0	0	0
LEFT ARROW	0	0	0	0	0	L	0	0	0	0	0	0	0	0	0	0	0	0
F1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
F2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
F3	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
F4	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
NEXT	0	0	0	0	0	0	0	0	0	0	0	N	0	0	0	0	0	0
TEST	0	0	0	0	0	0	0	0	0	0	T	0	0	0	0	0	0	0
ENTER	0	0	0	E	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CONDITIONS	0	0	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COPY	0	P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ORIGIN	O	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X home sensor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	0
Y home sensor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Y

Normal status : 0

Key Test

While the key is pressed : corresponding character

The PAUSE key can be checked by observing its lamp.

Sensor Test

The status of each sensor is displayed on the LCD panel.

KEY & SNS TEST MODE
0000000000000000XY

Display	Sensor name	Operation when the High/Low level changes	
2nd bit	X home sensor	When the dog blocks the sensor	X
1st bit	Y home sensor	Same as the above	Y

If a sensor is not operating properly, check its wiring, its connector contact, and the position of the sensor dog. If everything checks out all right, either the sensor or main board may be defective.

In this case, initialize the NOV-RAM and then run the sensor test again.

As a temporary measure for dealing with a defective sensor, turn off the plotter, set Bit 6 of the DIP switch to OFF, and then turn the plotter back on.

CAUTION:

When the plotter is turned back on, the pen position becomes the plot area's origin (0, 0) and the plotter is not initialized.

Unless the plot area is set, the cutting mat may be damaged and a position error may be caused by the pen block striking the side plate.

(3) If a panel key's corresponding bit does not properly change status, check the following.

- Fault in D1 or D2 on the Key Relay Board; or they may be attached in reverse
- Improperly connected cable. Reconnect the cable and then run this test again
- Initialize the non-volatile RAM
- Defective main board

8.15 List of Items Requiring Readjustment

If you replaced any of the units listed in the table below or altered their sensor positions, be sure to readjust the corresponding items.

Unit name Item	Main board	Main relay board	X home sensor	Y home sensor	Pen block	X,Y motor	X,Y Motor drive belt
NOV-RAM clear and model selection	M						
Firmware upgrade	N						
Pen height adjustment	M	M			M		
Pen force adjustment	M				M		
Distance adjustment	M					M	
Home position adjustment	M		M	M			
Pen interval adjustment	M				M		M
Auto registration sensor adjustment	M						
Belt tension adjustment						M	M

No mark: Adjustment unnecessary

M: Must always be adjusted

N: To be adjusted as necessary

Note: The main board must have the latest version of firmware unless otherwise specified.

8.16 About Start Up Mode

It starts up in each start mode when starting while pressing the key to the table below when the power supply is turned on.

Key	Mode	Remark
F1	Displayed in Japanese	
F3	Displayed in English	
Upper arrow	Setup Clear	The cutting conditions are returned to the factory setting. If your customer is changing conditions, you should print out the condition list before performing this mode.
Lower arrow	Special setting menu	
Right arrow + left arrow	System firmware update	

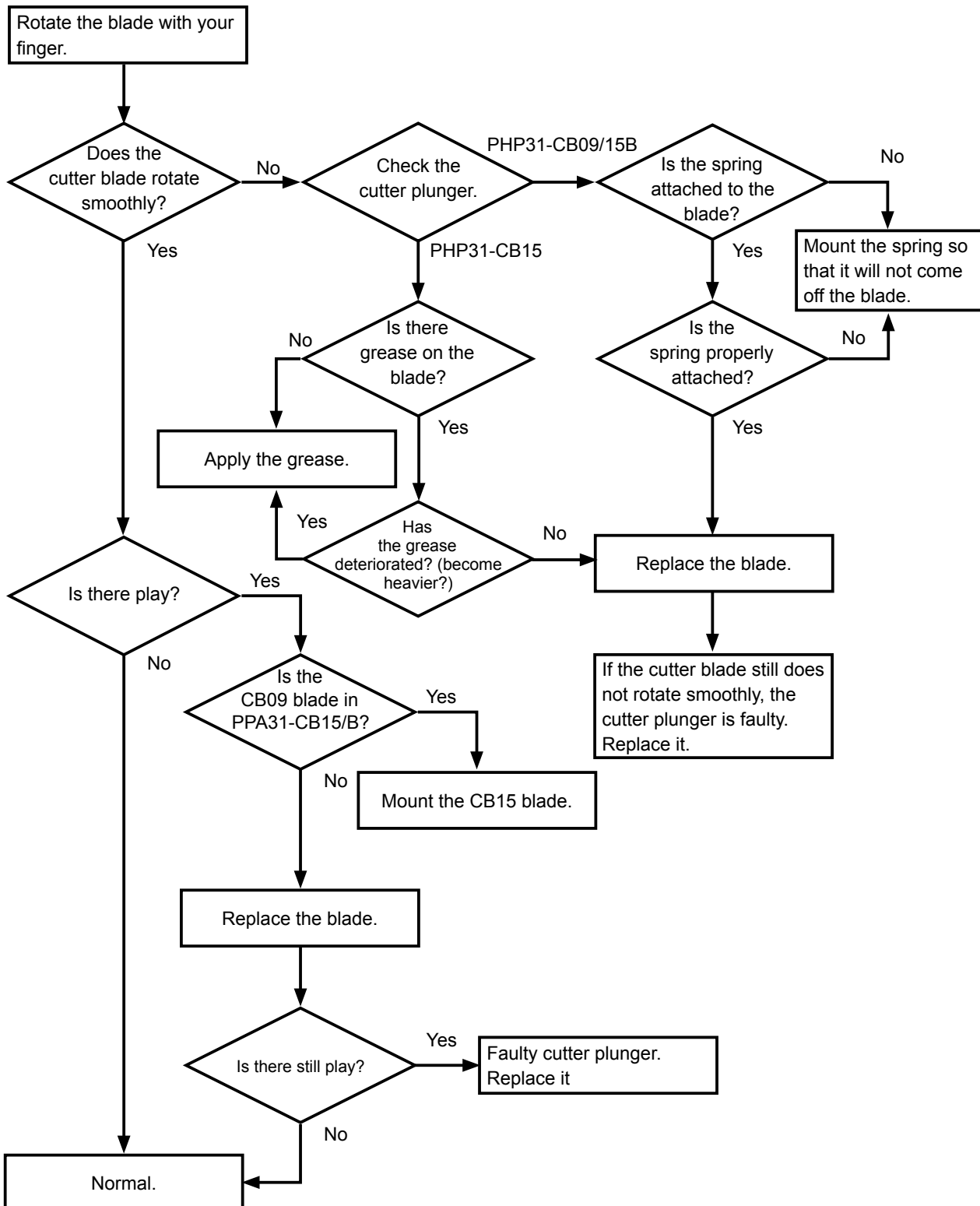
9 TROUBLESHOOTING

9.1 Troubleshooting Flowcharts

9.1.1 Checking for Faulty Rotation of the Blade

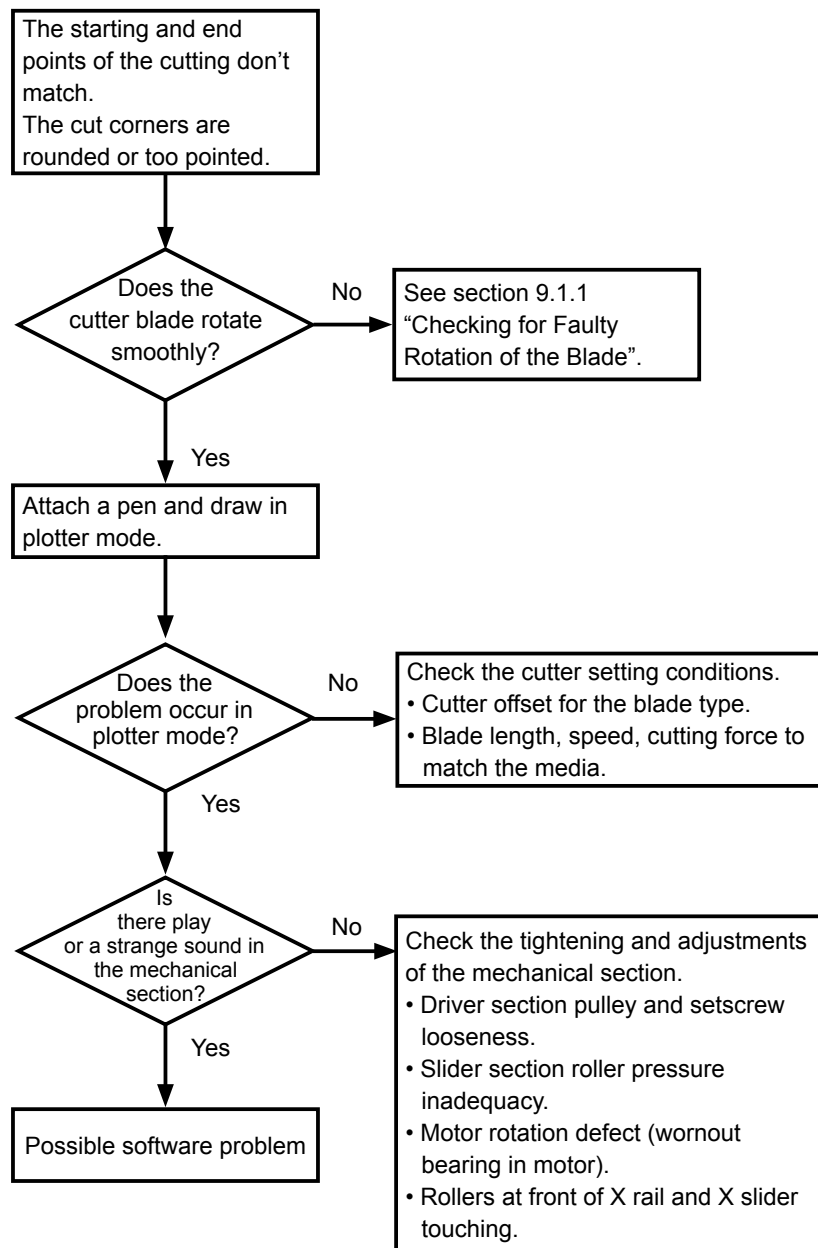
Cutting cannot be properly performed if the blade mounted in the holder does not rotate smoothly or if there is play between the holder and blade because their diameters do not match.

Use the flowchart below to check for faulty rotation of the blade.

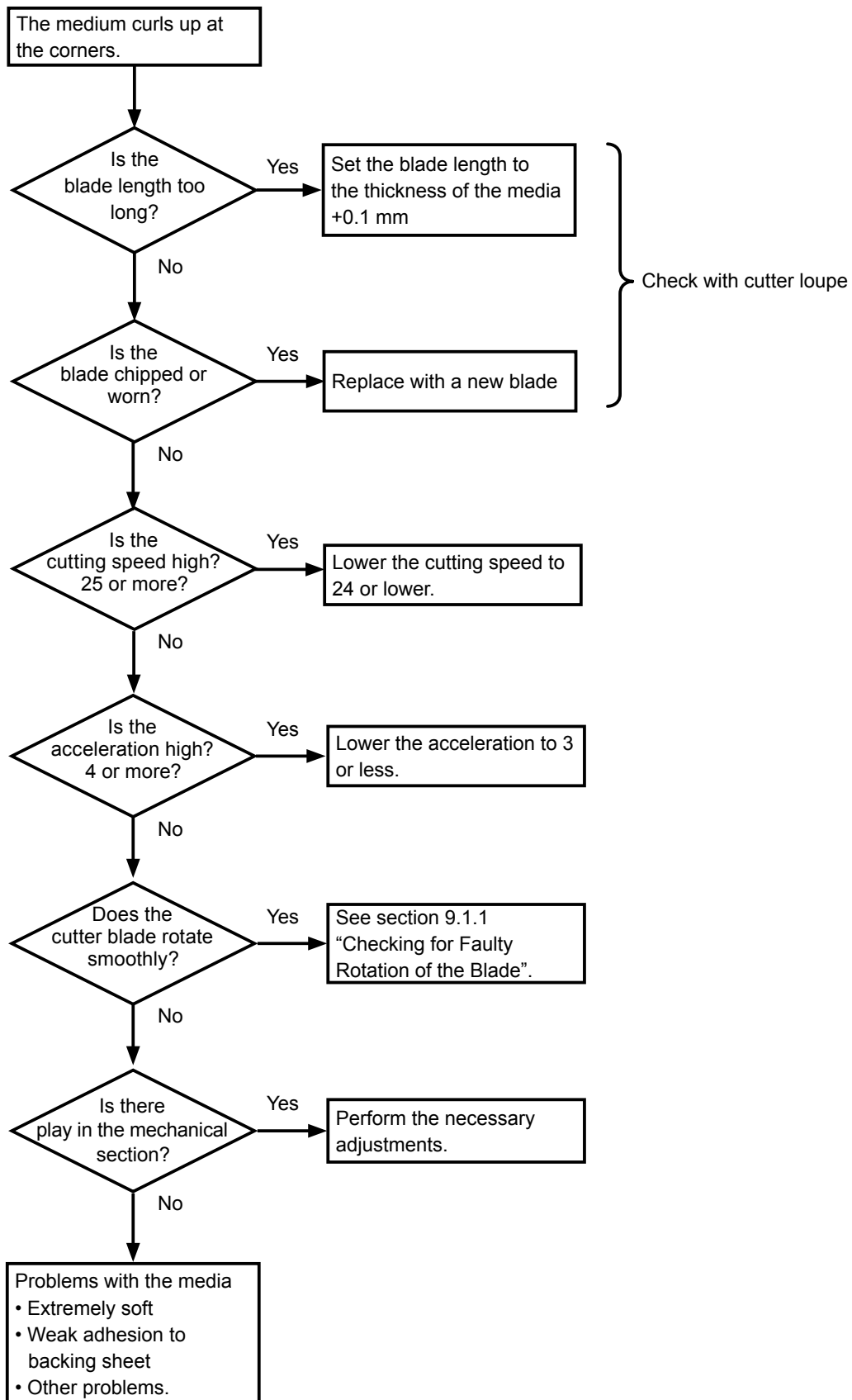


9.1.2 The Cutting Media Cannot be Satisfactorily Cut

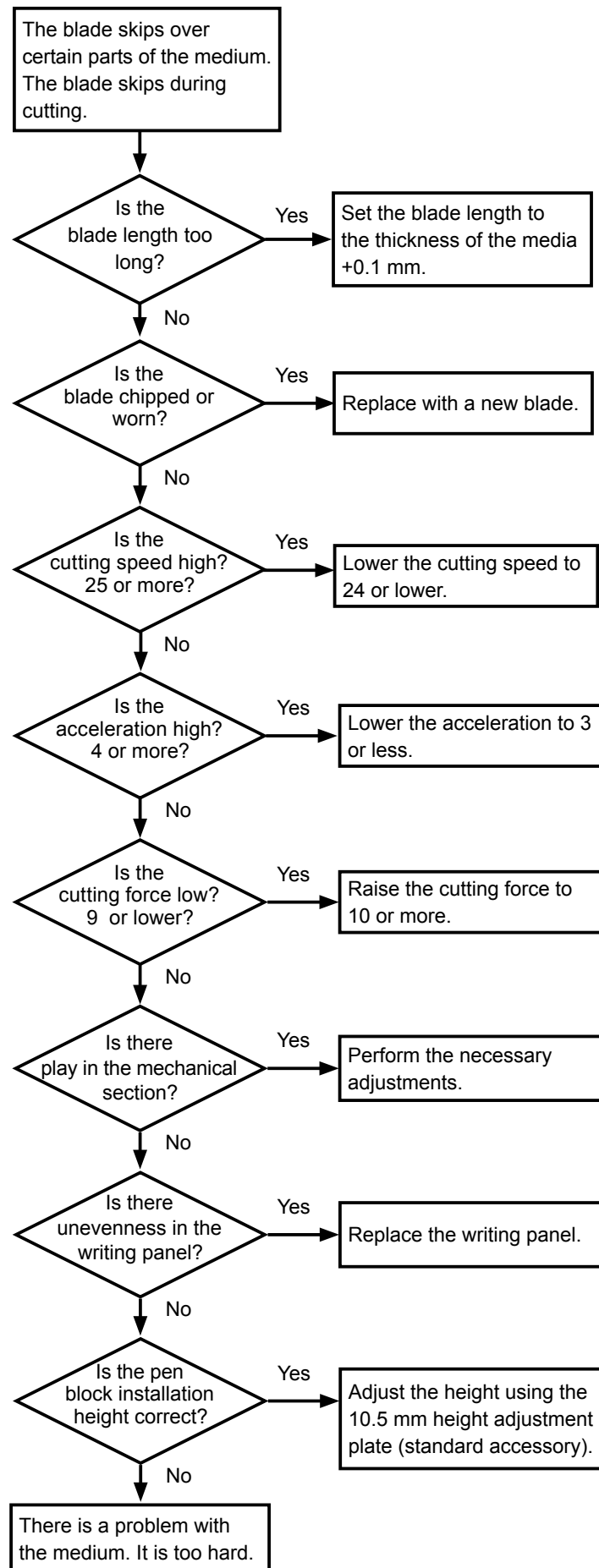
Part 1



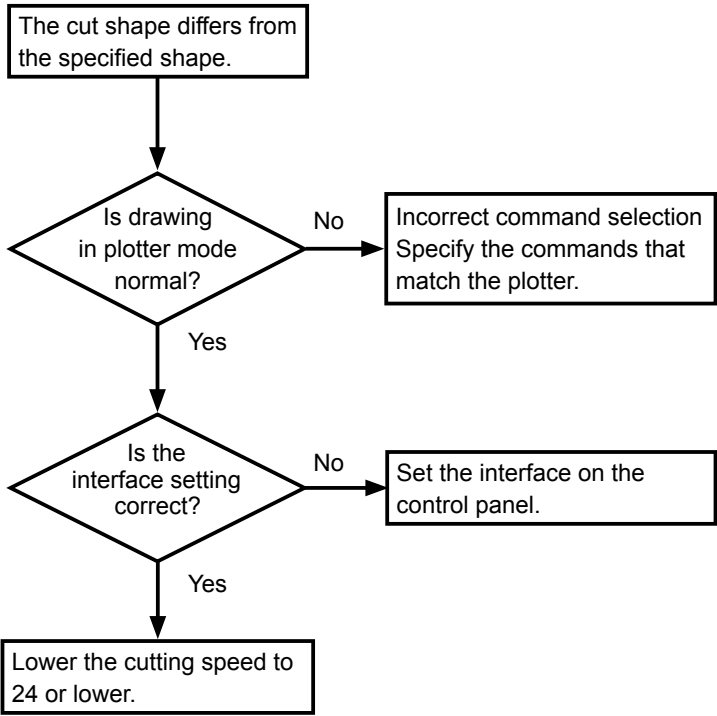
Part 2



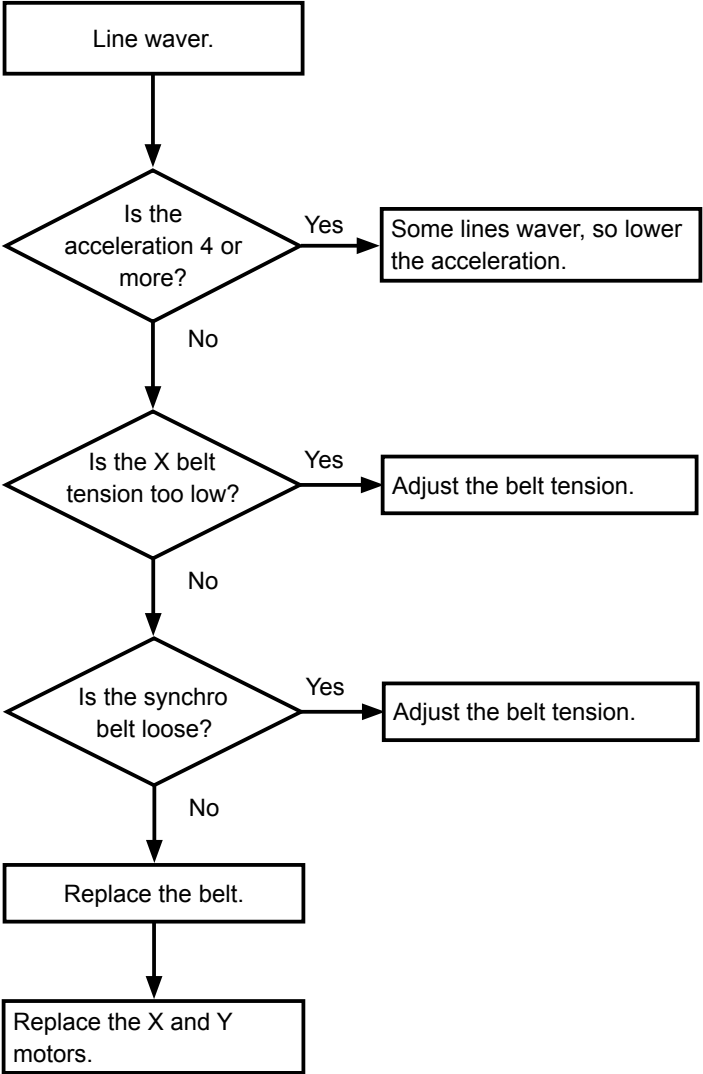
Part 3



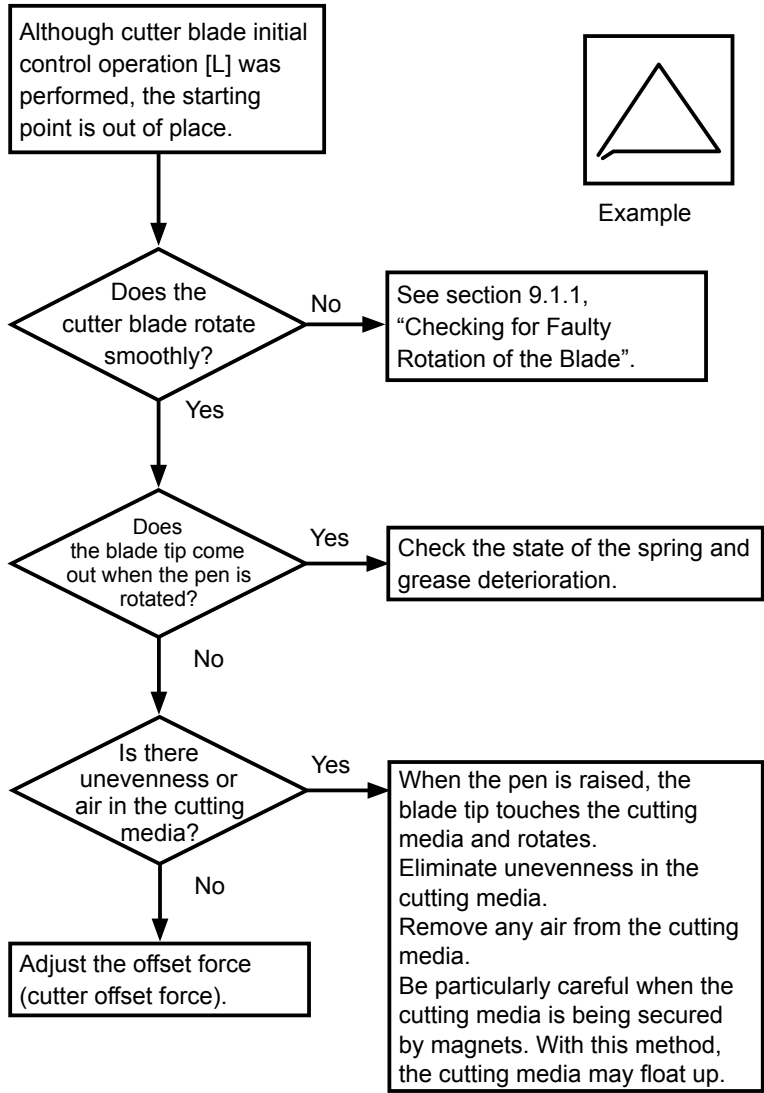
Part 4



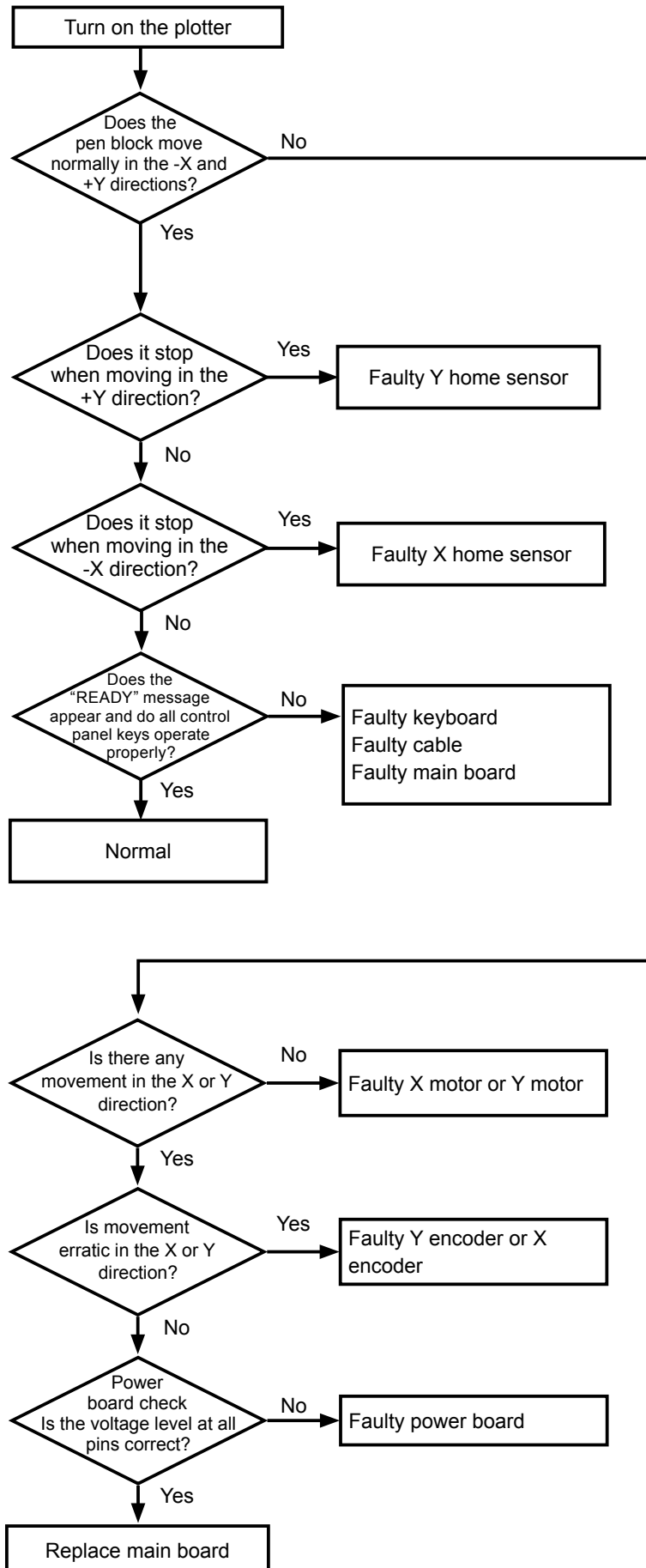
Part 5



Part 6



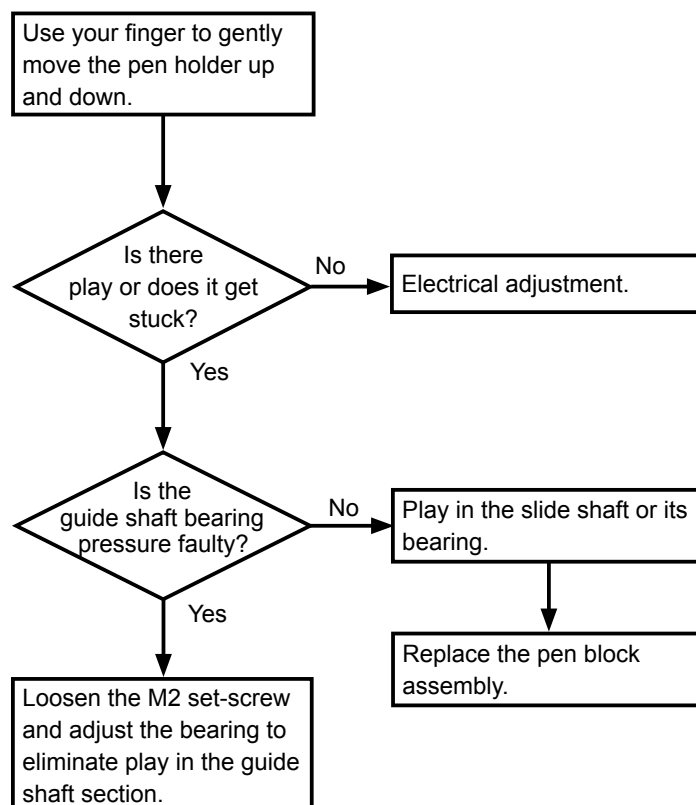
9.1.3 Initialization is Abnormal



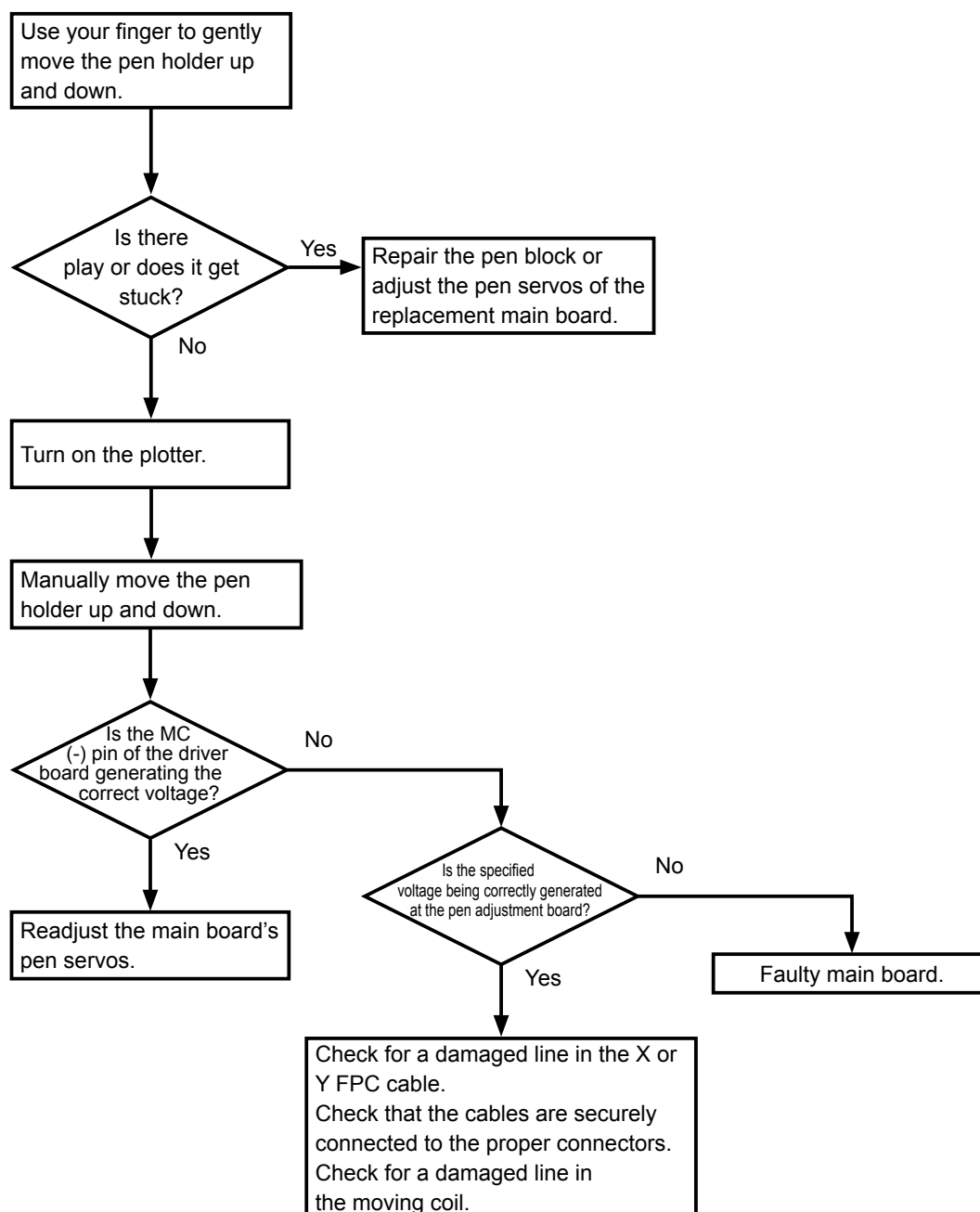
9.1.4 Pen UP/DOWN Operations are Abnormal

Be sure to turn off the plotter before performing the following checking procedures.

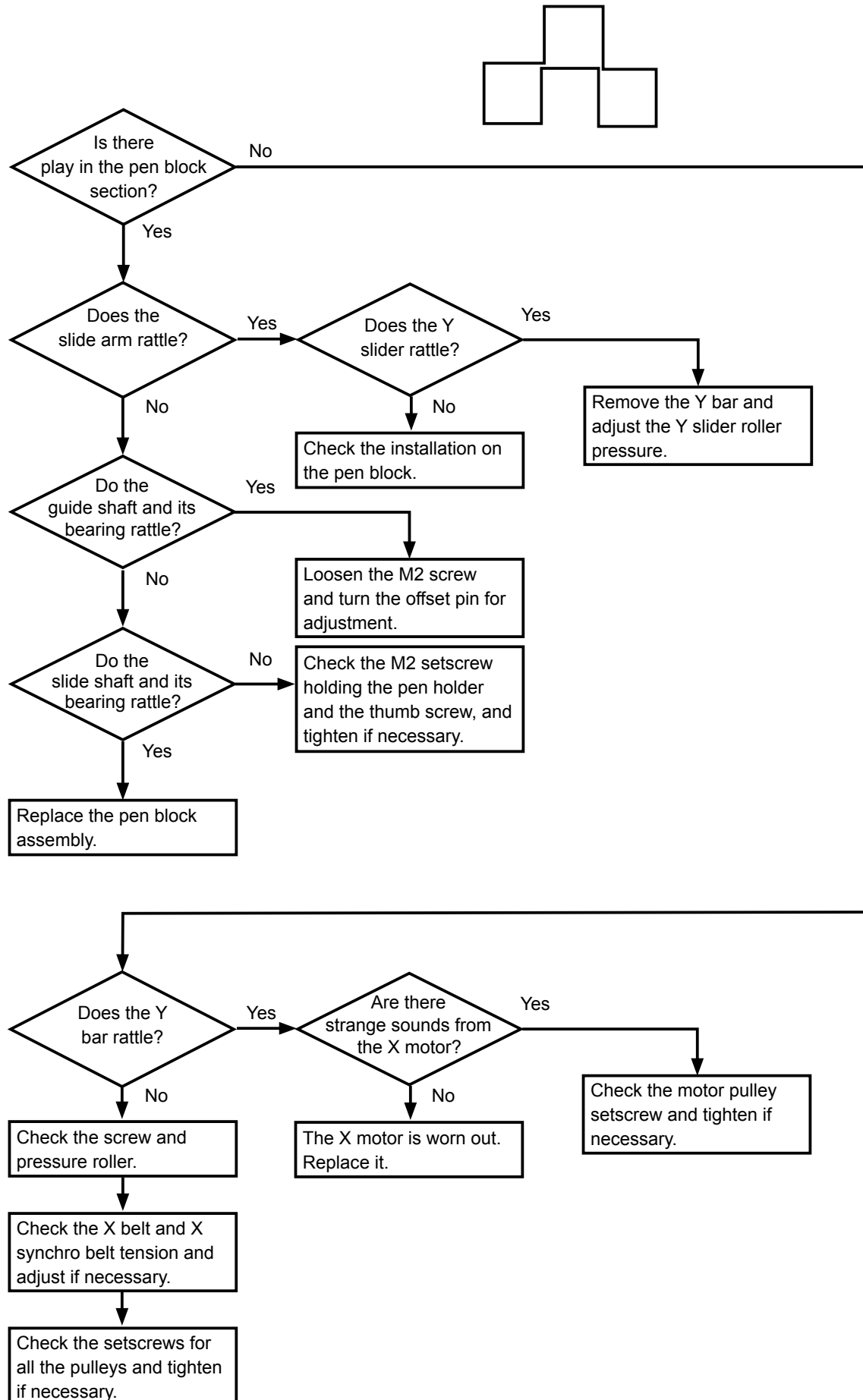
Part 1



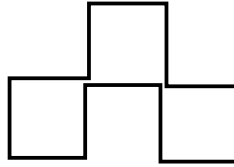
Part 2



9.1.5 The X-axis Backlash is Excessive



9.1.6 The Y-axis Backlash is Excessive



- (1) Adjust the perpendicularity of the Y bar (see section 7.12, “Adjusting the Perpendicularity Precision”).
- (2) Adjust the Y belt tension.

9.2 The Plotter is Turned On But Doesn't Operate

Symptom	Cause	Solution
- The control panel's POWER lamp does not light. - Nothing appears on the display panel.	• The plotter is not being supplied with power.	→ Check that the power cord is securely connected to the plotter's AC line inlet and the electrical output.
	• The plotter is defective.	→ Check the main board and connectors.
- The control panel's POWER lamp lights but the plotter does not operate. - The control panel's PAUSE lamp flickers. - Nothing appears on the display panel.	• The system firmware is defective.	→ Reinstall the system firmware or replace the main board.
The POWER LED lamp lights and the LCD displays a sum check error. Sum-Ck ROM RAM ERR!!	• The System firmware is defective.	→ Reinstall the system firmware or replace the main board.

9.3 Error Messages

Error Display	Cause	Verification item	Solution
OVER CURRENT POWER OFF THEN ON	Cutting conditions do not suit the cutting medium.	Cutting conditions	Lower the cutting SPEED and/or the cutting FORCE.
POSITION ALARM POWER OFF THEN ON - The beeper sounds - The PROMPT lamp flickers	Movement of the pen carriage is being obstructed.	Is there anything blocking the X or Y slider?	Turn off the plotter, remove the obstacle, then turn the plotter back on.
	Excessive load is causing the current to the motor to exceed the rated value.	(1) Have the Y bar retaining brackets been removed?	No Remove the Y bar retaining brackets. Yes.....Verify item (2)
		(2) Does the X or Y slider move smoothly?	No Check and adjust the X or Y belt tension and X or Y motor belt tension. Yes.....Verify item (3).
		(3) Is the X or Y flexible cable securely connected?	No Connect it securely. Yes.....Replace the X or Y flexible cable if defective.
	Home sensor or sensor plate adjustment.	(4) Is the X or Y home sensor plate position correct?	No Check and adjust the X or Y home sensor plate position. Yes.....Verify item (5).
		(5) Is the X or Y home sensor position correct?	No Check and adjust the X-home sensor position. Yes.....Replace the X-home sensor if defective.
	Motor	(6) Does the X-motor turn smoothly?	No Replace the X-motor if defective. Yes.....Replace the main board if defective.
SPEED ALARM POWER OFF THEN ON - The beeper sounds - The PROMPT lamp flickers	The internal speed control is faulty.	(1) Is the main servo axes gain adjustment correct?	No Adjust the main servo axes gain. Yes.....Verify item (2)
		(2) Does the X or Y slider move smoothly?	No Check and adjust the X or Y belt tension and X or Y motor belt tension. Yes.....Verify item (3).
		(3) Is the X or Y flexible cable securely connected?	No Connect it securely. Yes.....Replace the X or Y flexible cable if defective.

9.4 Error Messages in GP-GL Command Mode

Error Display	Cause	Verification item	Solution
ERROR 1 COMMAND ERROR	The plotter received an unrecognizable command.	(1) Did the plotter receive an unrecognizable command?	No Verify item (2) Yes.....Send correct data to plotter.
		(2) Is there any noise on the line?	No Verify item (3) Yes.....Check the interface cable or move the plotter to another location.
		(3) Has the correct model name been set for the plotter?	No Set the correct model name. Configure your software application menu to permit Graphtec plotter control. Re-specify the software application's interface conditions.
ERROR 4 PARAMETER OVERFLOW	- The software configuration regarding the output device has been changed. - The plotter's interface conditions have been changed.	The numeric parameter of an input command exceeds its permissible range.	Configure your software application menu to permit Graphtec plotter control. Re-specify the software application's interface conditions.
ERROR 5 I/O ERROR		An error related to the receipt of data occurred within the interface.	Set the correct model name if it was incorrect.

9.5 Error Messages in HP-GL Emulation Mode

If any of the following command errors occur, they are nearly always caused by one of the reasons below:

- (1) The software configuration regarding the output device has been changed; or
- (2) The plotter's interface conditions have been changed

When a command error occurs in HP-GL™ emulation mode, therefore, first check the two corresponding points below:

- (1) Configure the software to drive your plotter, and ensure that the software's interface conditions are correctly set; and
- (2) Ensure that the plotter's interface conditions are set to match those of the software.

Error Display	Cause	Verification item	Solution
ERROR 1 Instruction not recognized	An unrecognizable instruction was executed. Execute a recognizable command.	(1) Did the plotter receive an unrecognizable command?	No Verify item (2) Yes Send correct data to plotter.
		(2) Is there any noise on the line?	No Verify item (3) Yes Check the interface cable or move the plotter to another location.
		(3) Has the correct model name been set for the plotter?	No Set the correct model name. Configure your software application menu to permit Graphtec plotter control. Re-specify the software application's interface conditions.
ERROR 2 Wrong number of parameters	A command was executed with the wrong number of parameters.	Execute the command with the correct number of parameters.	Configure your software application menu to permit Graphtec plotter control. Re-specify the software application's interface conditions.
ERROR 3 Out of range parameters	A command containing an unusable parameter was specified.	Execute the command with its parameters specified within their permissible ranges.	Set the correct model name if it was incorrect.
ERROR 5 Unknown character set	An unrecognizable character set was specified.	Specify a recognizable character set.	

Error Display	Cause	Verification item	Solution
ERROR 6 Position overflow	A command was executed with coordinate data that exceeds the effective cutting/plotting area	Execute the command with its coordinate data specified within the effective cutting/plotting area.	Configure your software application menu to permit Graphtec plotter control. Re-specify the software application's interface conditions. Set the correct model name if it was incorrect.
ERROR 7 Buffer overflow	The data being input exceeded the capacity of the plotter's downloadable character buffer, polygon buffer, etc.	Decrease the downloadable characters, polygons.	
ERROR 10 Invalid I/O output request	During execution of an output command, another output command was executed.	Check the flow of your programmed data.	
ERROR 11 Invalid byte following ESC	The ESC character was followed by an invalid byte.	Check the ESC commands in your program.	
ERROR 12 Invalid byte I/O Control	A device control command containing an invalid byte was received.	Check the device control commands in your program.	
ERROR 13 Out of range I/O parameter	A parameter outside of the permissible numeric range was specified.	Check the program.	
ERROR 14 Too many I/O parameters	Too many parameters were received.	Check the number of command parameters.	
ERROR 15 Error in I/O transmission	During data transfer, a framing error, parity error, or overrun error occurred.	Check the settings of the interface conditions.	
ERROR 16 I/O buffer overflow	The I/O buffer received data at a faster pace than it could process, indicating that handshaking is not successful.	Check the settings of the handshaking mode and other interface conditions.	

9.6 The Cutting Results are Unsatisfactory

Problem	Cause	Solution
The cut corners are rounded or too pointed.	The cutter OFFSET is incompatible with the blade type being used.	Adjust the cutter OFFSET value: * If too low, corners become rounded. * If too high, corners are too pointed.
The cut line starts out crooked.	The blade mounted in the holder does not rotate smoothly.	For CB15 holders (red blade adjustment knob), grease the blade and holder. Remove any foreign matter inside the pen holder.
	The Offset Cut Pressure is too low.	Raise the Offset Cut Pressure setting (the Offset Cut Pressure is separate from the cutting FORCE).
	With the CB15B cutter pen (green blade adjustment knob) and the CB09 cutter pen (blue blade adjustment knob), the spring has come loose from the blade.	Replace the blade with a new one that has a spring.
	With the CB15 cutter pen (red blade adjustment knob), the blade has fallen out.	Grease the blade and holder (B).
The blade skips and does not completely cut lines that should be solid. Solid lines are not cut at a constant depth.	The blade is extended too far.	Adjust the blade length.
	The cutting SPEED is too high.	Lower the SPEED setting.
Coarse resolution of curved lines.	The software's resolution setting is too low.	Adjust the software's resolution setting.
	The blade offset angle is too low.	Raise the blade offset angle.
The film curls up at the corners. The film curls up when cutting small characters.	The blade is extended too far.	Adjust the blade length.
	The cutter OFFSET is incompatible with the blade type being used.	Adjust the cutter OFFSET value: * If too low, corners become rounded. * If too high, corners are too pointed.
	The cutting SPEED is too high.	Lower the SPEED setting.
	The blade is dull.	Replace the blade.
	The QUALITY setting is too high.	Lower the QUALITY setting.
The blade is cutting into the backing sheet.	The blade is extended too far.	Adjust the blade length.
	The cutting FORCE is too high.	Lower the FORCE setting.
The blade falls out of the cutter plunger.	The blade is too small for the holder.	Use a blade that fits securely in the holder.
	Insufficient grease.	For CB15 holders (red blade adjustment knob), grease the cutter blade and holder.

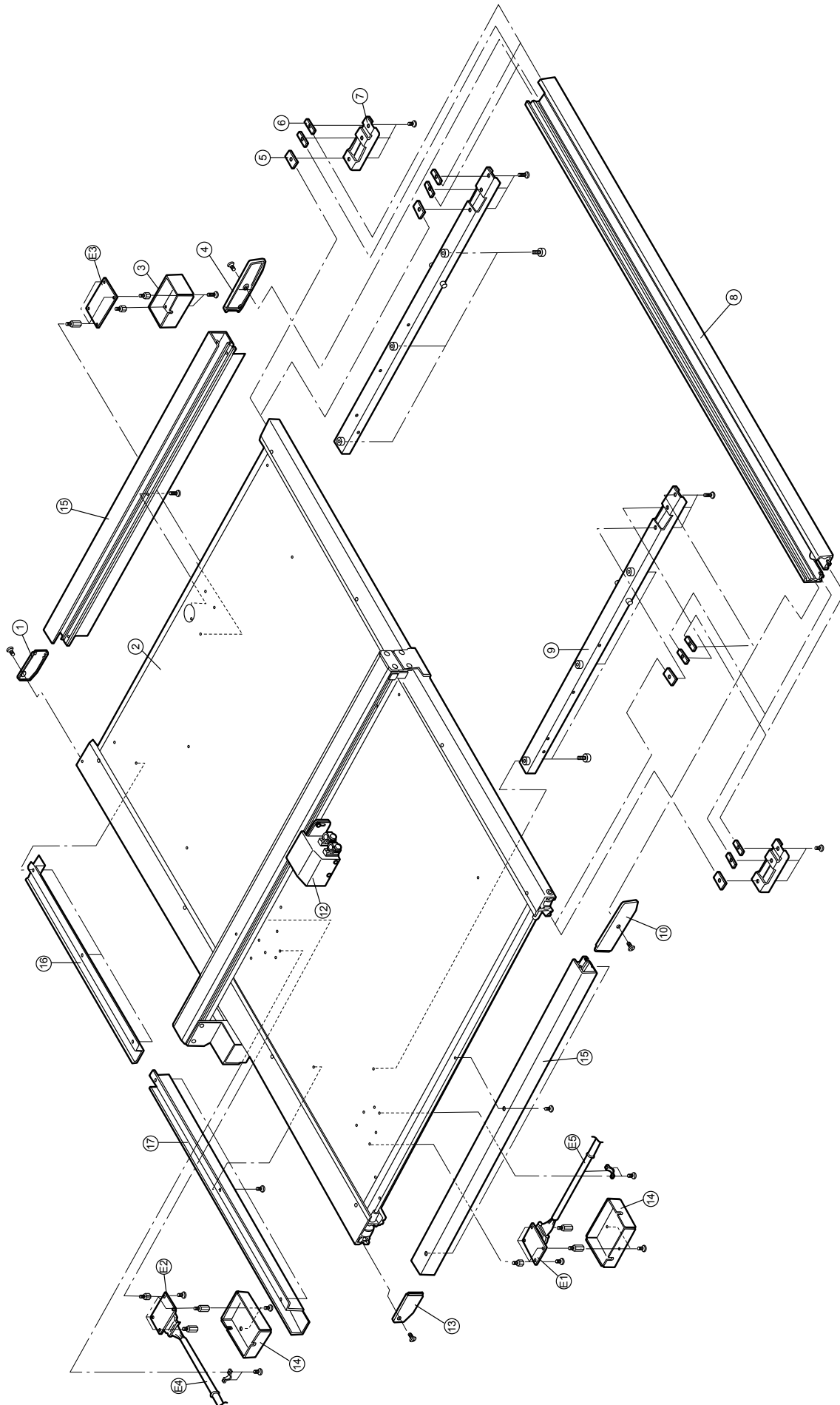
Problem	Cause	Solution
Film can be cut but is hard to weed afterward.	The retack sheet is not sticky enough.	Switch to a retack sheet that is more sticky.
Cut film cannot be picked up using a retack sheet.	Film gets entangled during cutting.	Reduce the blade length and/or lower the cutting FORCE.
	Weeding of cut film was postponed too long.	Promptly weed cut film.
Abnormal noise generated by the cutter pen during cutting. The film is discolored where the blade has passed.	Film is stuck in the tip of the cutter plunger.	Adjust the blade length and cutting FORCE setting.
The cutting results differ from the specified size.	The programmable resolution (STEP SIZE) has been set differently at the plotter and the software application. Scaling has been specified at the software application	Set both the plotter and software to the same resolution. Check whether scaling has been specified.
When the plotter is receiving data, the PROMPT lamp lights (an offscale error occurs). Some parts of the film cannot be cut.	The programmable resolution (STEP SIZE) has been set differently at the plotter and the software application.	Set both the plotter and software to the same resolution.
	The computer sent coordinate data that exceeds the specified effective cutting area.	Set the effective cutting area to a larger area.
	The computer sent coordinate data that exceeds the maximum effective cutting area.	Switch to larger film or change the coordinate data.
The currently selected cutting conditions are disregarded or cannot be changed.	The Parameter Priority setting is set to program mode. The ENTER key was not pressed after changing the settings.	Change the Parameter Priority setting to manual mode. Make sure you are setting the conditions correctly.
Characters or lines are deformed during pen plotting.	The plotter is in Cutting mode.	Set the blade type of the cutter OFFSET function to PEN (0).
The length of cutting results differ from the program (slight distance error).	The distance correction requires adjustment.	Adjust the distance correction.
Cut characters are deformed.	The Step Pass is too high.	Lower the Step Pass setting.
The starting and end points of cutting do not match.	Coordinate points are incorrectly specified. The Offset Cut Pressure is too low. The film is too flimsy. Blade rotation is not smooth.	Check the coordinate data by plotting it with a pen. Raise the Offset Cut Pressure setting. Switch to a stronger film. For CB15 holder (red blade adjustment knob), grease the cutter blade and holder.

10. PARTS LISTS

10.1 Mainframe

No.	Part No.	Description	Q'ty	Remarks
E1	792256707	X Relay Board	1	PN6121-11C Assembly
E2	792256702	X Flex. Board	1	PN6121-03 Assembly
E3	775421740	High Voltage Board	1	PR31001C Assembly
E4	692247080	Y Cable 60/120	1	CA504208
	692247090	Y Cable 180		CA504209
E5	692236133	X Cable	1	CA2290-03
1	621474130	Corner Cover (Rear Right)	1	
2	022900082	Electrostatic Panel 12	1	FC2250-120ES
	022900202	Electrostatic Panel 18		FC2250-180ES
	022900132	Magnetic Sheet 90		FC2250-120MG
	792200706	Vacuum Panel 60		FC2250-60VC
	792201220	Vacuum Panel 120		FC2250-120VC
	792201260	Vacuum Panel 180		FC2250-180VC
3	022907302	Power Board Cover	1	
4	621474110	Corner Cover (Front Right)	1	
5	022907323	Plate Nut	4	M4-18
6	022907293	Plate Nut	8	M4-12
7	022907233	Frame End Holder Plate	2	
8	022901330	Tray 60	1	FC2250-60
	022900740	Tray 120		FC2250-120
	022900750	Tray 180		FC2250-180
9	022907410	Main Frame	2	FC2250-120/180
	622301660	Main Frame 60		FC2250-60
10	621474100	Corner Cover (Front Left)	1	
12	792256711	FC2250 Pen Block Assembly	1	
13	621474120	Corner Cover (Rear Left)	1	
14	022907253	Board Cover	2	
15	621474140	Side Cover	2	
16	022903753	X Flexible Guide 120 Right	1	FC2250-120
	022903722	X Flexible Guide 180 Right		FC2250-180
17	022901340	X Flexible Guide 60 Left	1	FC2250-60
	022903722	X Flexible Guide 120 Left		FC2250-120
	022903781	X Flexible Guide 180 Left		FC2250-180

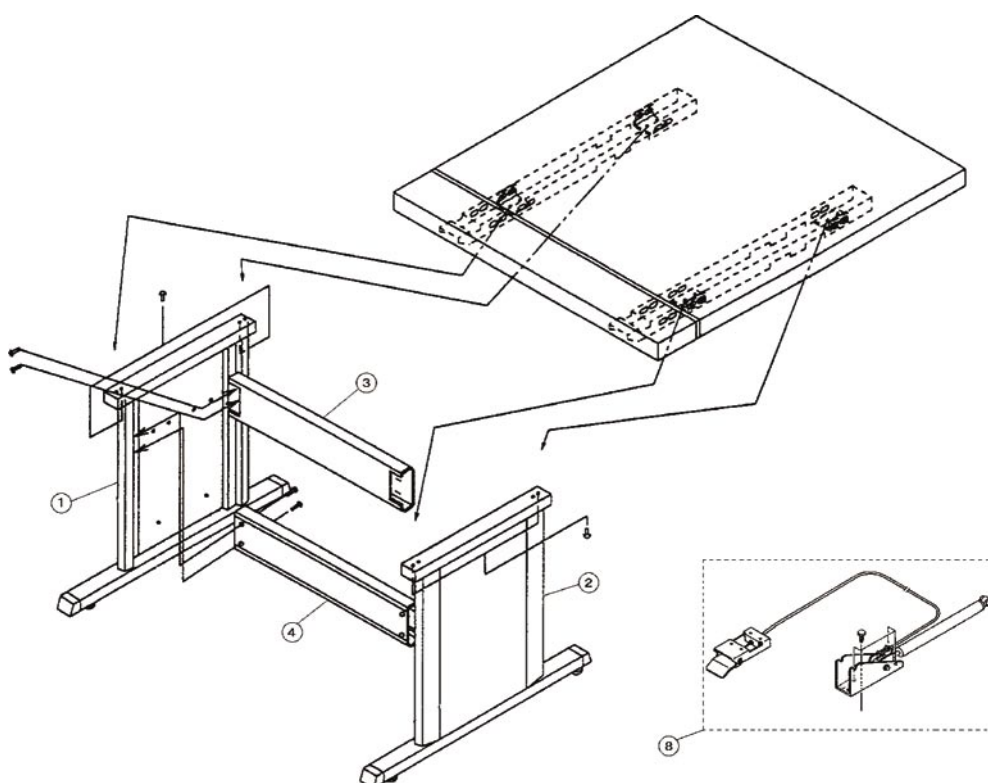
Mainframe



10.2 Stand

No.	Part No.	Description	Q'ty	Remarks
1	621470940	Left Side Foot 60	1	FC2250-60
	621480920	Left Side Foot 90/EX		FC2250-120/180
2	621470950	Right Side Foot 60	1	FC2250-60
	621470930	Right Side Foot F223		FC2250-120/180
3	054221031	Rear Main Bar 60	1	FC2250-60
	622301800	Rear Main Bar 90		FC2250-120
	622301760	Rear Main Bar EX		FC2250-180
4	054221021	Front Main Bar 60	1	FC2250-60
	622301790	Front Main Bar 120		FC2250-120
	622301730	Front Main Bar 180		FC2250-180
8	772290670	Gas Spring Assembly 120	1	FC2250-120ES/MG
	772232670	Gas Spring Assembly EX		FC2250-180ES
	621470901	Stand 60 Assembly	1	FC2250-60
	621480901	Stand 120 Assembly		FC2250-120
	621490901	Stand 180 Assembly		FC2250-180

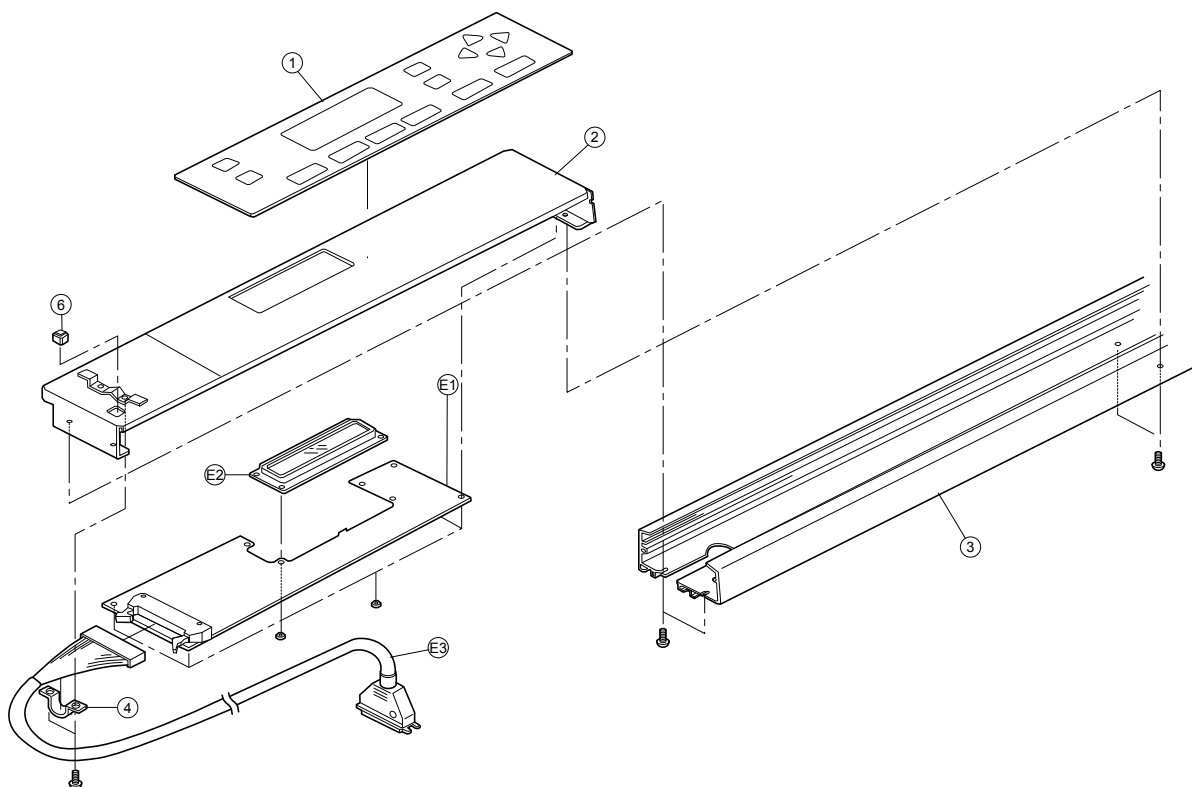
Stand



10.3 Control Panel

No.	Part No.	Description	Q'ty	Remarks
E1	772232010	Key Rely Board	1	PR223281
E2	772232020	LCD	1	
E3	692236110	Control Cable	1	CA2290-01
1	682247030	Sheet Switch	1	PN5042-03
2	621476001	Panel Frame	1	
3	022901330	Tray 60	1	FC2250-60
	022900742	Tray 120		FC2250-120
	022900750	Tray 180		FC2250-180
4	022900572	Cable Holder	1	
5	772230260	Chart Hold Switch	1	ES
	772230860	Panel, Blind		VC/MG

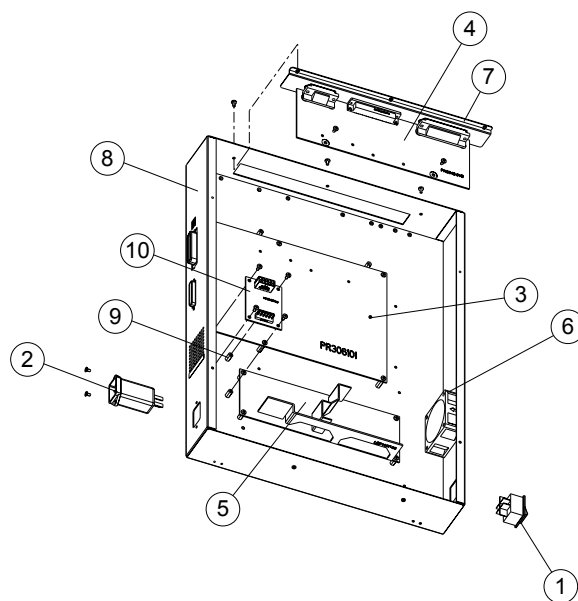
Control Panel



10.4 Control Unit

No.	Part No.	Description	Q'ty	Remarks
1	508102306	Power Switch	1	SW,2WI36/92
2	518000033	AC Inlet	1	SUP-B3G-E
3	792256700	Main Board	1	PN6121-01
4	792256701	Main Relay Board	1	PN6121-02
5	682247530	Switching Power Supply	1	LEP100F-36
6	500050273	Fan	1	TUDC24B4
7	621476141	Connector Panel	1	
8	621476123	Control Box	1	
9	395030100	Stad, ASB-310E	8	
10	772247590	Power Supply Relay Board	1	PN5042-04

Control Unit



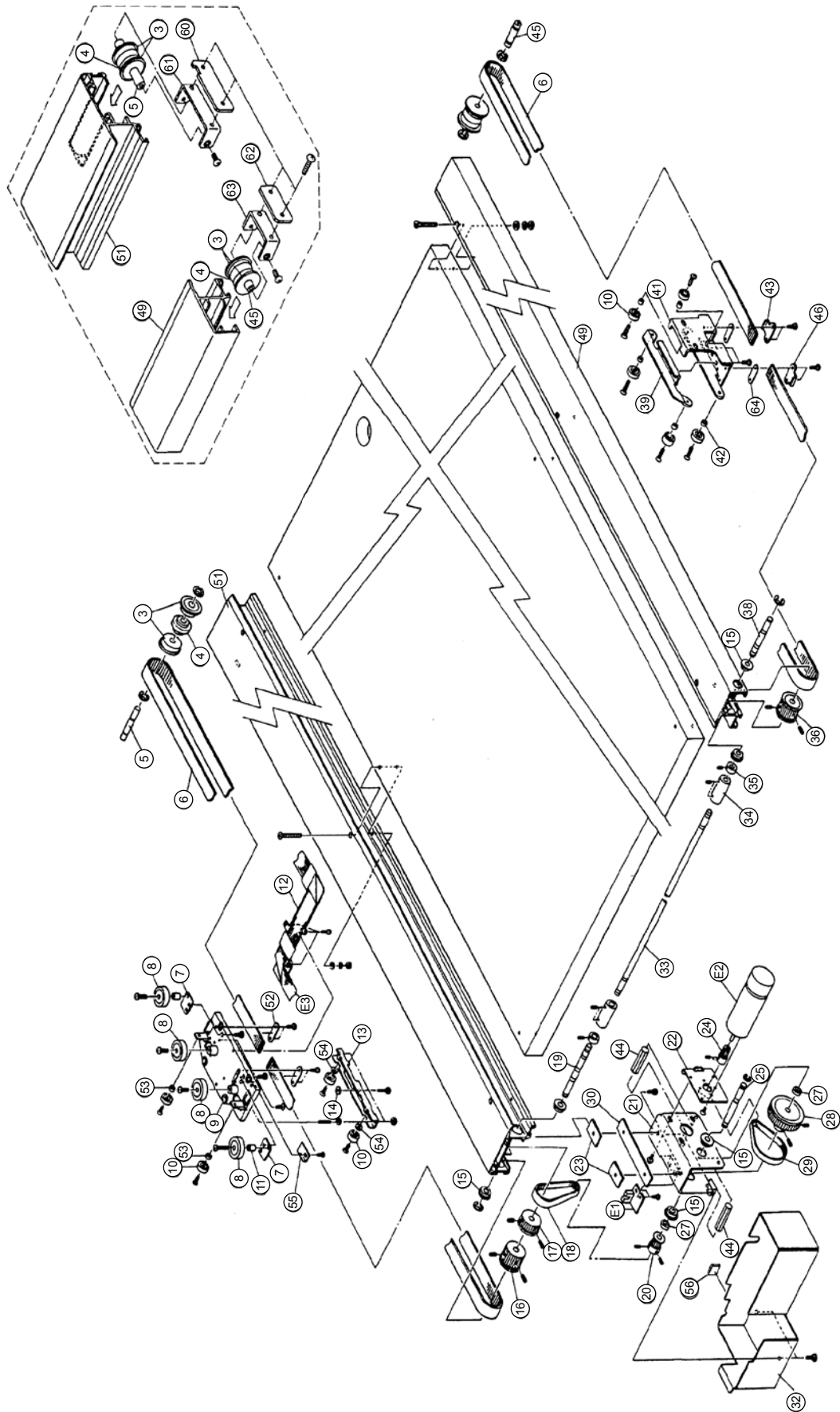
10.5 X Drive Unit

No.	Part No.	Description	Q'ty	Remarks
3	311060820	Bearing	4	F608ZZMC3PS2S
4	022904221	Bearing Spacer	2	
5	022903590	Pulley Shaft, Right	2	
6	022904500	X Belt	2	S2ML2350, FC2250-60
	022904510	X Belt 120		S2ML3200, FC2250-120
	022904520	X Belt EX		S2ML4200, FC2250-180
7	022903673	Roller Lever	2	
8	022900400	Roller ø27	3	
9	022903535	X Slider	1	
10	020003131	Roller	9	
11	022903681	Roller Collar A	2	
12	022903665	Flexible Plate	1	
13	022903872	Lower Bracket, Right	1	
14	022903912	X Roller Collar	1	
15	311068820	Bearing	6	F688ZZMC3PS2S
16	022902541	Drive Pulley R	1	S2M
17	022903262	Pulley	1	60Z-TN
18	372290003	Notched Synchro Belt	1	120TN15-15W
19	022903181	Drive Shaft, Rear	1	
20	022903151	Pulley	1	30Z-TN
21	022903105	Gear Box	1	
22	022903113	X-Motor Bracket	1	
23	022903122	Box Fitting Plate	2	
24	053206101	Motor Pulley	1	Z22
25	022903133	Intermediate Shaft	1	
27	022900360	Drive Collar C	1	
28	022903250	Pulley	1	99Z-TN
29	375311001	Notched Synchro Belt	1	120TN15
30	022900352	X Gear Space Board	1	
32	621472201	X Motor Cover	1	
33	022903242	Drive Shaft M	1	
34	022903291	Coupling	2	
35	022903212	Collar	2	
36	022902531	Drive Pulley F	1	S2M
38	022903191	Drive Shaft, Front	1	
39	022903853	Lower Bracket, Front	1	
41	022903524	X Slider, Front	1	
42	022903912	X Roller Collar	5	
43	022903653	Belt Plate D	1	
44	395030350	Space Shaft	1	ASB335E
45	022903580	Pulley Shaft, Front	1	
46	022903643	Belt Plate C	1	
49	022901320	X Rail, Front 60	1	FC2250-60
	022903500	X Rail, Front 120		FC2250-120
	022903761	X Rail, Front 180		FC2250-180
51	022901310	X Rail, Rear 60	1	
	022903512	X Rail, Rear 120		
	022903773	X Rail, Rear 180		
52	022903632	Belt Plate B	2	
53	022903693	Roller Collar B	2	
54	022904213	Spacer ø04-1.5	2	
56	362200005	Rubber Foot	1	SJ5008
E1	792256708	X Limit Switch	1	PN6121-12C
E2	772290110	X Motor	1	UGFMEDA5LGR28
E3	692256220	X Flexible Cable 60/120	1	FC2250-60/120
	692256230	X Flexible Cable 180		FC2250-180

10. PARTS LIST

No.	Part No.	Description	Q'ty	Remarks
60	022904541	XR End	1	
61	022904561	XR Pulley Bracket	1	
62	022904531	XF End	1	
63	022904551	XF Pulley Bracket	1	
64	622301630	Belt Plate	2	

X Drive Unit



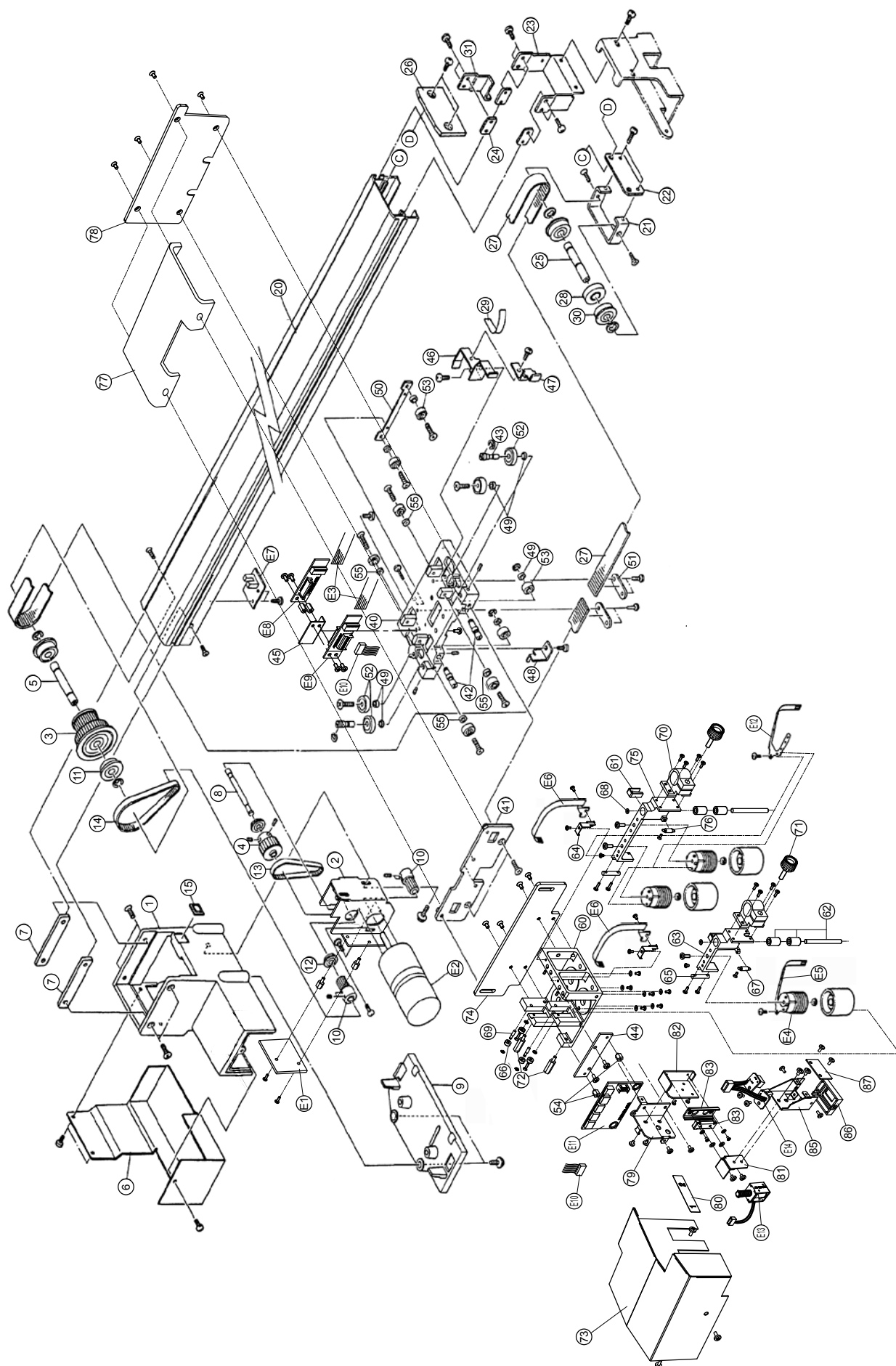
10.6 Y Drive Section

No.	Part No.	Description	Q'ty	Remarks
1	621473401	Y Gear Box	1	
2	621473411	Y Motor Bracket	1	
3	022903363	Pulley	1	88Z-TN
4	022903372	Pulley	1	44Z-TN
5	022903331	Y Pulley Shaft	1	
6	621473420	Y Motor Cover	1	
7	022903352	Y Bar Plate	2	
8	022903381	Shaft ø5	1	
9	022903535	X Slider R	1	
10	053206101	Motor Pulley	2	22Z
11	311068820	Bearing	2	F688ZZ
12	311060520	Bearing	2	F605ZZ
13	379011002	Notched Synchro Belt	1	79TN15-10.0K
14	375311001	Notched Synchro Belt	1	120TN15-10.0W
15	362200005	Rubber Foot	1	SJ-5008
20	022904012	Y Bar	1	
21	022904033	Y Pulley Bracket	1	
22	022904230	Y F End	1	
23	022904063	Y Front Bracket	1	
24	022904072	Y Front Plate	3	
25	022904080	Bearing Shaft	1	
26	621473340	Y End Front Cover	1	
27	022904500	Y Belt	1	S2ML2350
28	022904221	Bearing Spacer	1	
29	022904331	Y-Flexible Cable Reinforcement	2	
30	311060820	Bearing	2	F608ZZMC3PS2S
31	022904252	Y Stopper	1	
40	022904025	Y Slider	1	
41	621473310	Plate PUF	1	
42	022904131	Offset Pin A	2	
43	022904151	Offset Pin C	2	
44	622563110	Pen PCB Bracket	1	
45	622563300	Y PCB Bracket	1	
46	022904182	Flexible Guard Bracket	1	
47	022904194	Flexible Plate	1	
48	022904204	Y Sensor Holder	1	
49	022904213	Collar ø4-1.5	6	
50	022904303	Roller Plate	1	
51	022903632	Belt Holder B	2	
52	020003131	Roller	4	
53	022900410	Roller ø12	8	
54	395830050	Spacer	2	SB-305
55	022904322	Y Roller Collar	4	
60	622564000	MC Base Block	1	
61	090113201	Long Magnetic Circuit Board A	2	A0000
62	022902280	Slide Shaft Assembly	2	
63	021500622	50 Slide Arm	1	
64	022906323	Hall IC Bracket	2	
65	053203390	Guide Shaft	2	
66	310069220	Bearing	4	BB692ZZMC3PS2S
67	053203350	MC Up Spring	1	
68	340804012	O Ring, S4	2	
69	034004591	Offset Pin	2	
70	021500632	Cutter Holder	2	
71	621113581	Thumb Screw L14	2	L14
72	302200069	Spacer CB307	2	
73	622564010	2-Pen Cover	1	
74	621473300	2-Pen Block Plate	1	
75	022902451	2P2 Slide Arm	1	
76	302200076	MC Up Spring E537	1	
77	621473320	Y Slider Cover T	1	
78	621473330	Plate PUR	1	

10. PARTS LIST

No.	Part No.	Description	Q'ty	Remarks
79	622563100	RMS Unit Base Bracket	1	
80	621473210	Pen Number Label	1	
81	622563210	RMS Slider	1	
82	622563200	Sensor Base Bracket	1	
83	311540114	Linear Guide	1	LL15-40
85	622563220	RM Sensor Bracket	1	
86	622563210	RMS Hood	1	
87	622563230	RMS Bracket Lid	1	
	792256711	2250-Pen Block Assembly	1	
E1	792256703	X-Y Relay Board	1	PN6121-04C Assembly
E2	772247550	Y Motor	1	UGFMED-B5LGRA6
E3	162291101	Y-Flexible Cable	2	FCA2291010A
E4	305320007	Moving Coil	3	PL-326B
E5	110006060	MC Flexible Cable	1	FPC10002
E6	792240702	Height Sensor	2	
E7	792256709	Y Limit Switch Assembly	1	PN6121-13C Assembly
E8	792256704	Pen Flex. Board 1	1	PN6121-06C Assembly
E9	792256705	Pen Flex. Board 2	1	PN6121-08C Assembly
E10	692256051	2-Pen Cable	1	CA612105A
E11	792256706	2-Pen Board Assembly	1	PN6121-08C Assembly
E12	122936111	MC T Flexible Cable	1	FPC2293110A
E13	500052472	RMS Solenoid	1	TDS-05B-DC12V
E14	792256710	Registration Mark Sensor Assy	1	

Y Drive Section

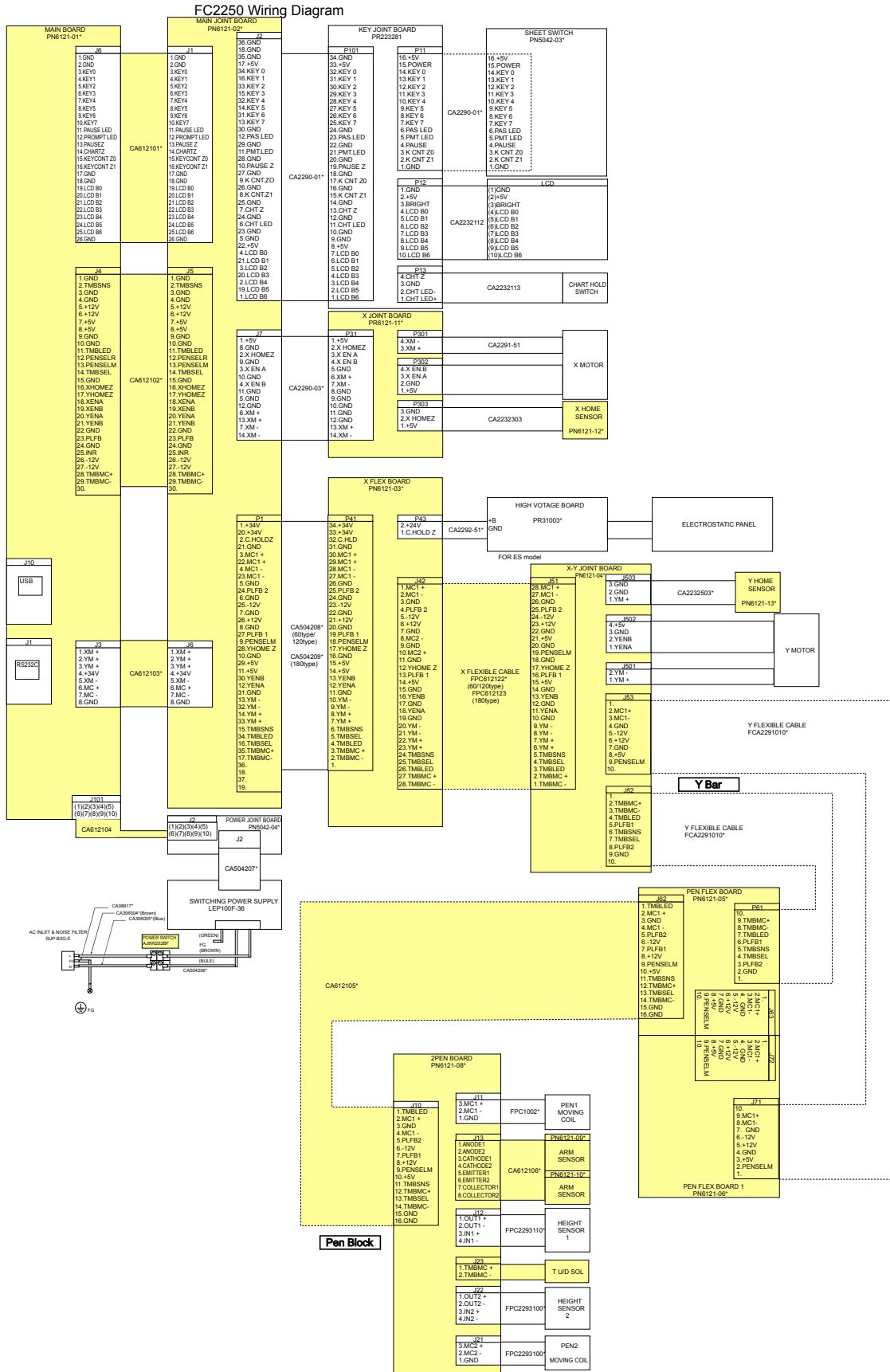


10.7 Standard Accessories

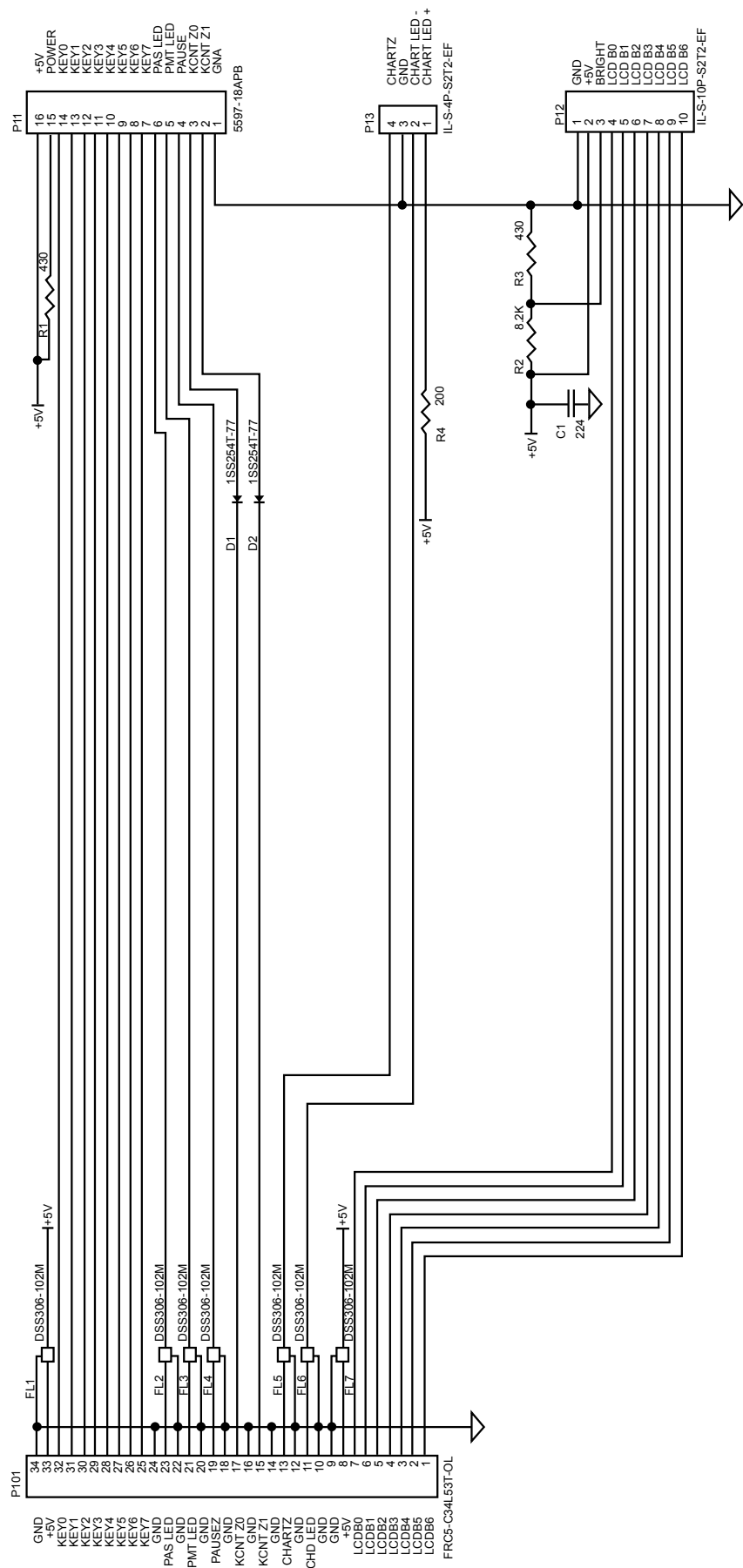
No.	Part No.	Description	Q'ty	Remarks
1	622560790	Pen Block Height Adjustment Plate	1	
2	022909561	Pen Height Adjustment Plate	1	
3	622569100	User's Manual FC2250-CDM01M	1	CD-ROM
4	621479910	Safety Manual ANCUTF-UM-AM1	1	
5	621479920	Quick Manual	1	
6	305812007	Hexagonal Wrench (2.5)	1	
7		AC Power Cable	1	
8	972100300	CB15U-2SP	1	
9	972100320	CB15U-K30-5SP	1	
10	910210160	PHP31CB15B-HS		
11	971118901	P4 KF552-BK (1P)	1	
12	302200102	Flexible Hose ø50 mm	1	V Type Only
13	302200104	Hose Band	2	V Type Only
14	302200018	Magnetic Plate (2 large, 2 medium, 4 small)	1	M Type Only
	772290800	Hanger Assembly	1	
15	022908050	Hanger F	1	
16	022908060	Hanger R	1	
17	022908070	Roller Shaft	1	
18	022908080	Nut R16	1	
19	022908590	Tray Nut 18	2	
20	022908590	Tray Nut 12	2	

11. BLOCK DIAGRAMS AND CIRCUIT DIAGRAMS

11.1 Wiring Connection

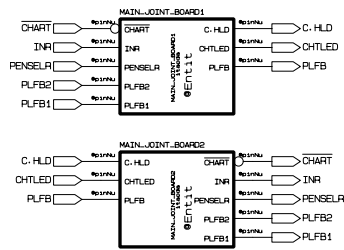


11.2 Key Relay Board (PR223281)



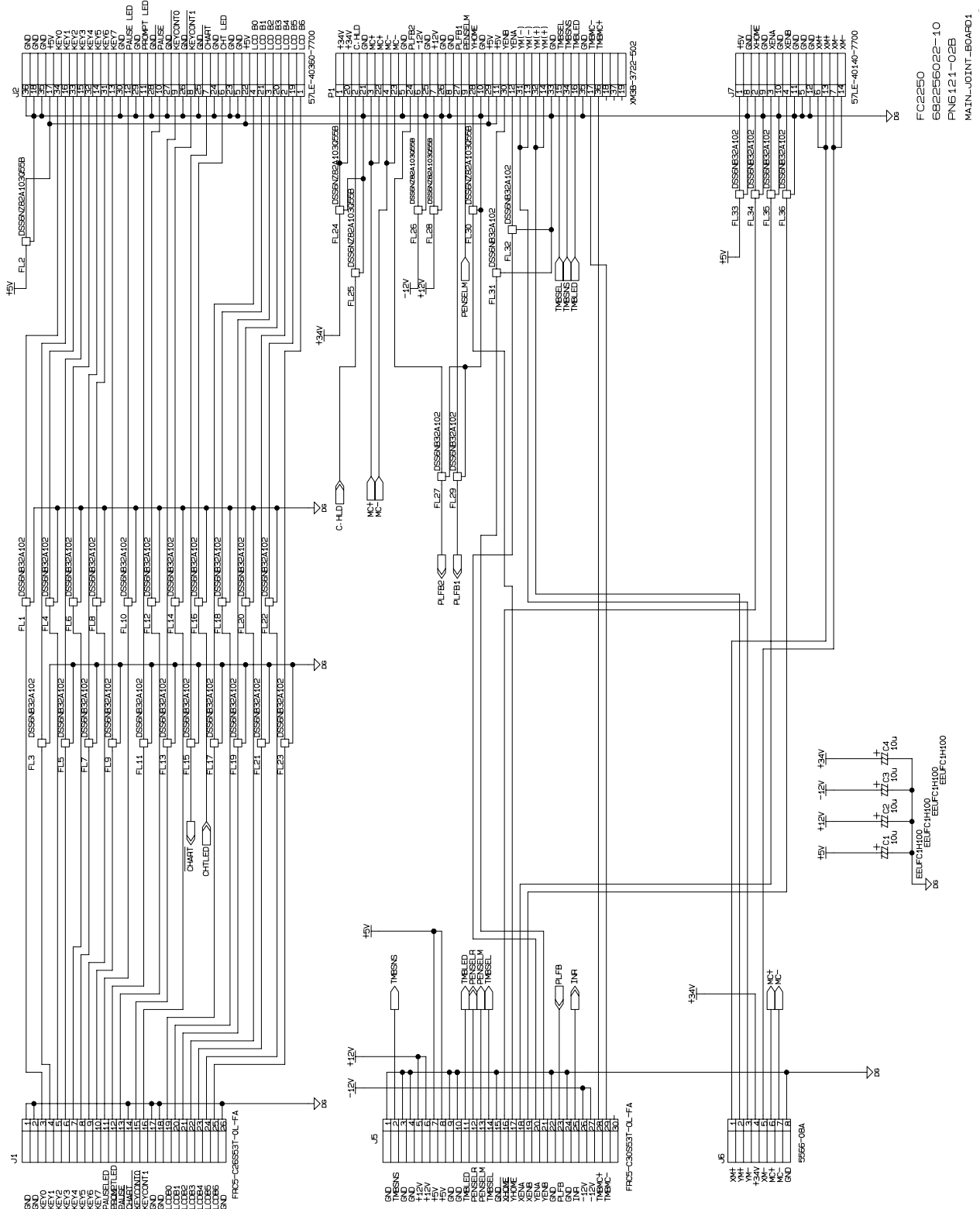
11.3 Main Relay Board (PN6121-02B)

Main Relay Board (PN6121-02B) Top



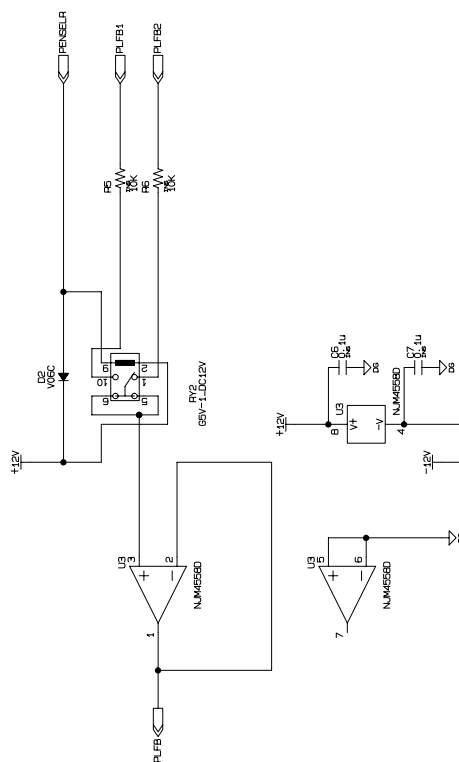
FC2250
682256022-10
PN6121-02B
TOP

Main Relay Board (PN6121-02B) 1/2

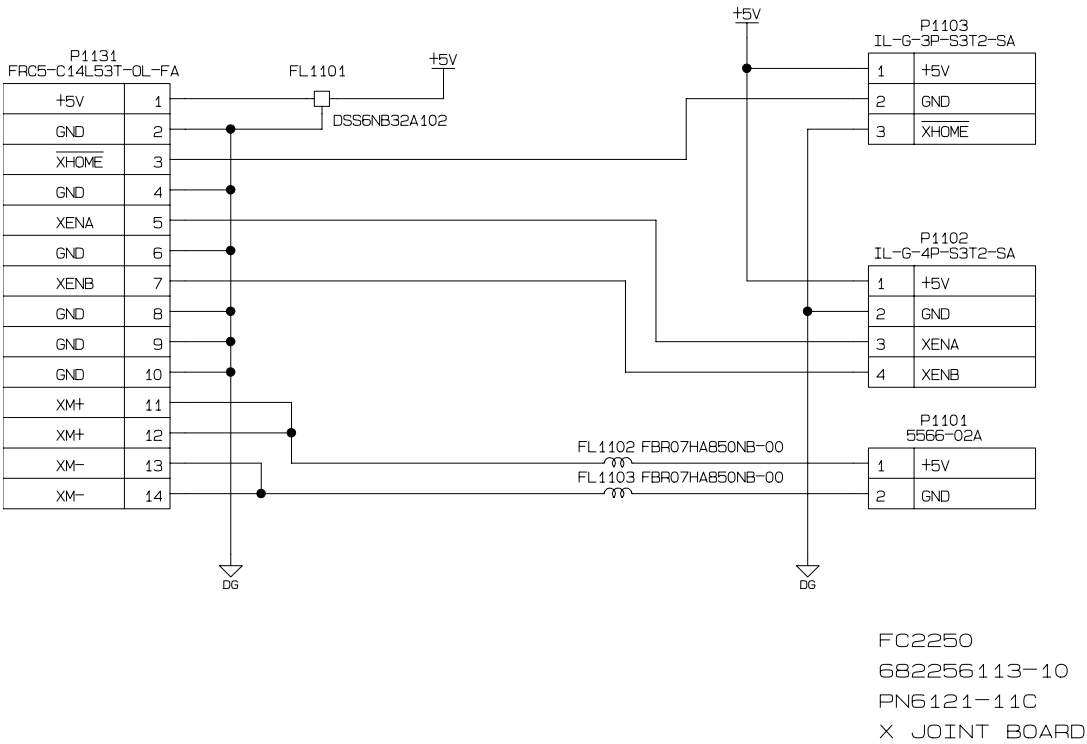


FC2250
582256022-10
PN61231-02B
MAIN_JOINT_BOARD2

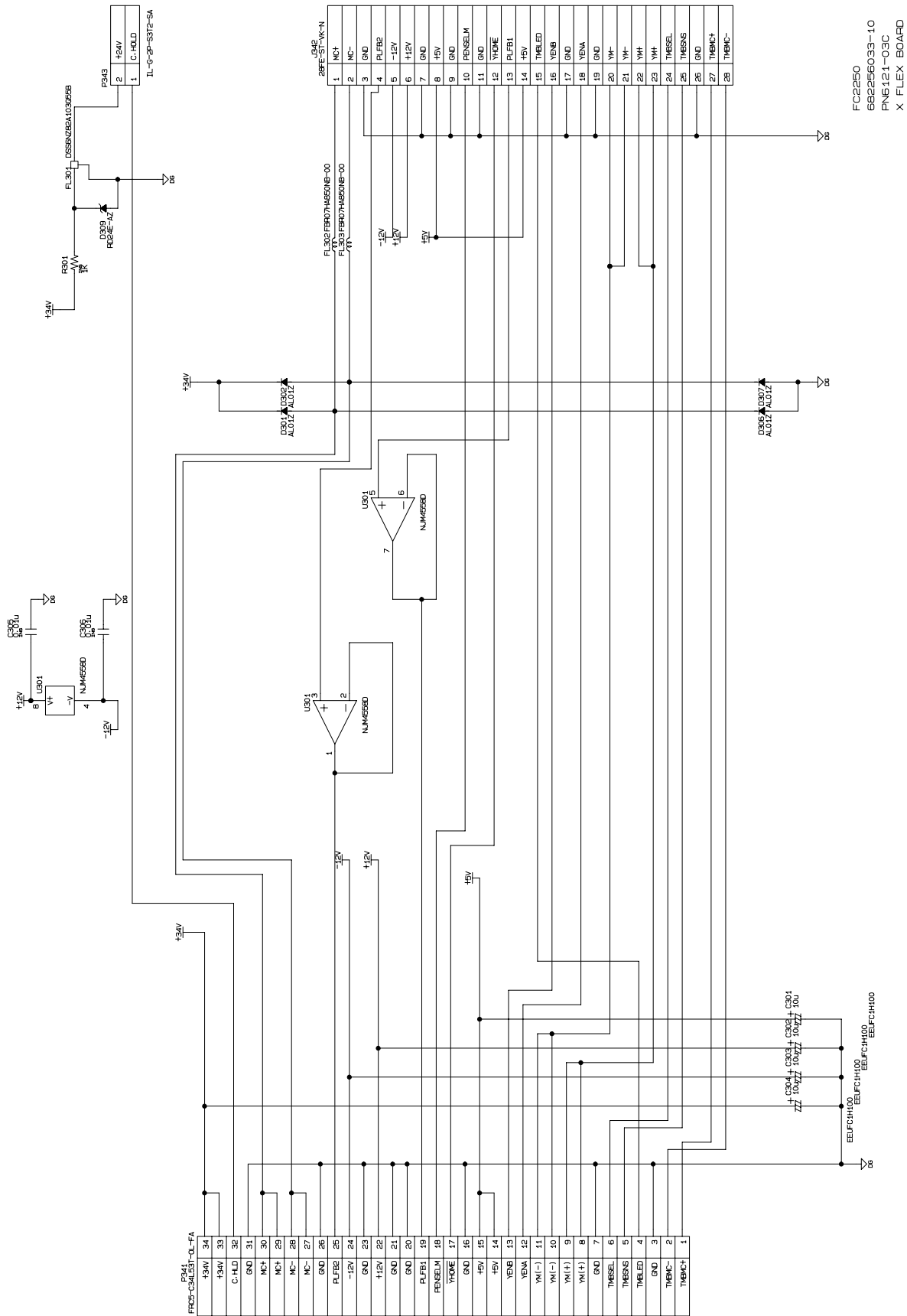
The diagram illustrates a 4-bit ripple-carry adder circuit. It consists of two 4-bit binary-to-decimal decoders, U1 (7441) and U2 (7442), which take a 4-bit binary input (A3, A2, A1, A0) and produce decimal outputs (0-9). The outputs of U1 and U2 are connected to a 4-bit ripple-carry adder circuit. The adder circuit uses two 7441 chips (U3 and U4) to perform the addition. The carry-in (CIN) is connected to the carry-in of U3. The carry-out (COUT) of U3 is connected to the carry-in of U4. The final sum (S3, S2, S1, S0) is taken from the outputs of U4. The circuit is powered by a 5V supply and includes a 10kΩ pull-up resistor (R1) and a 10kΩ pull-down resistor (R2).



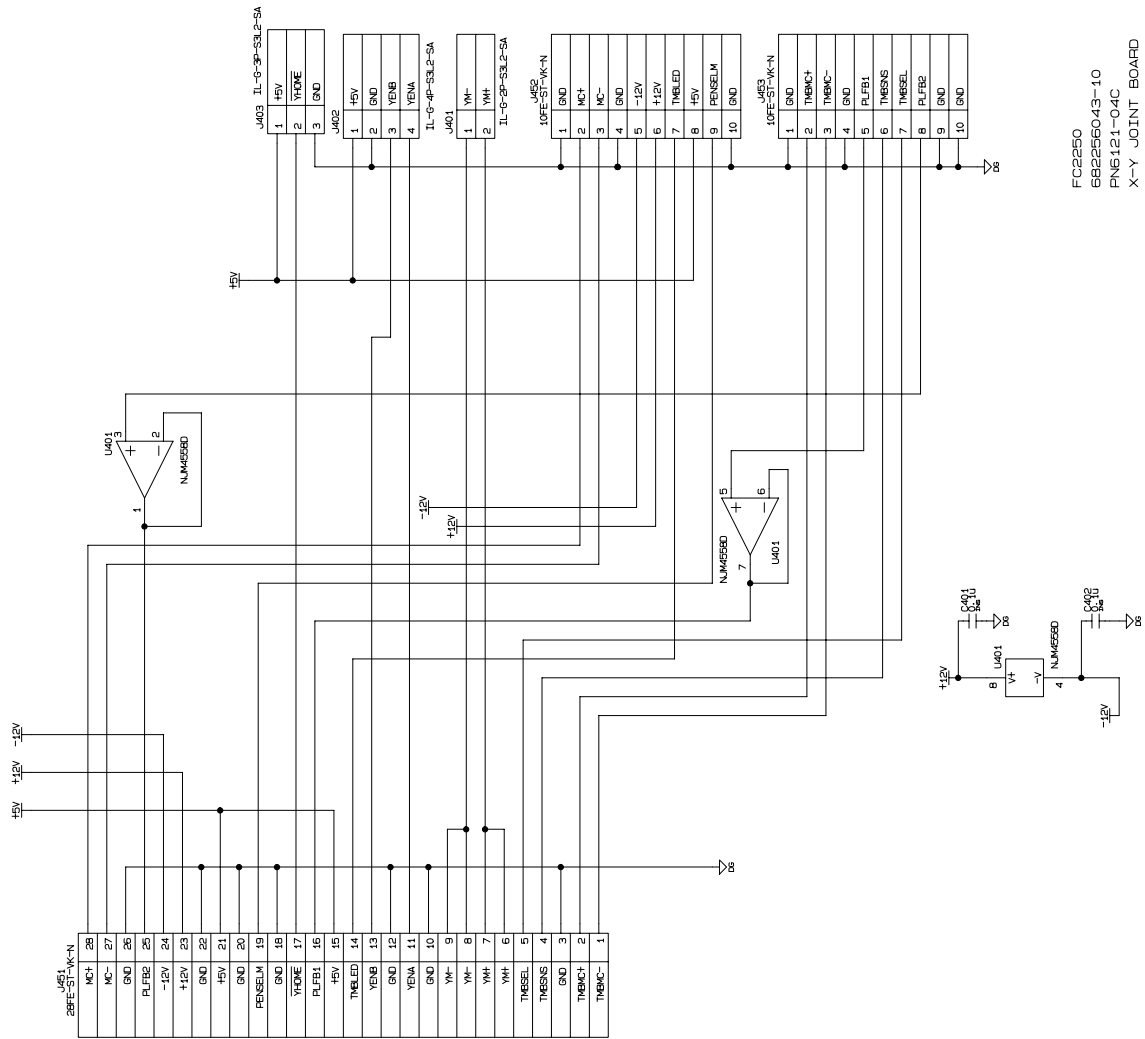
11.4 X Relay Board (PN6121-11C)



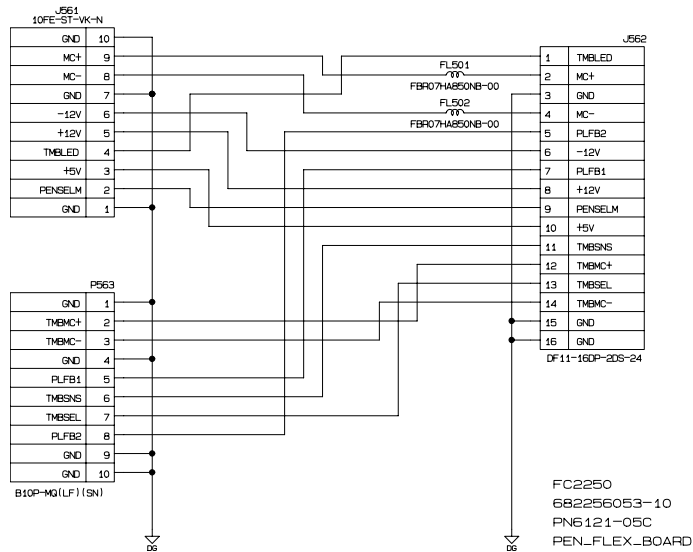
11.5 X Flex. Board (PN6121-03C)



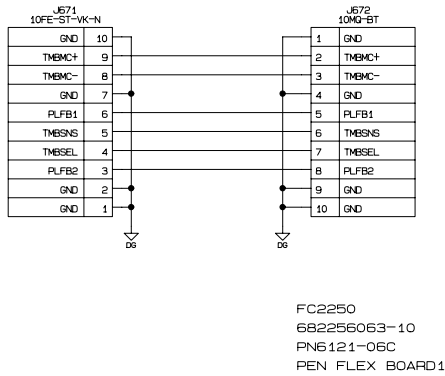
11.6 X-Y Relay Board (PN6121-04C)



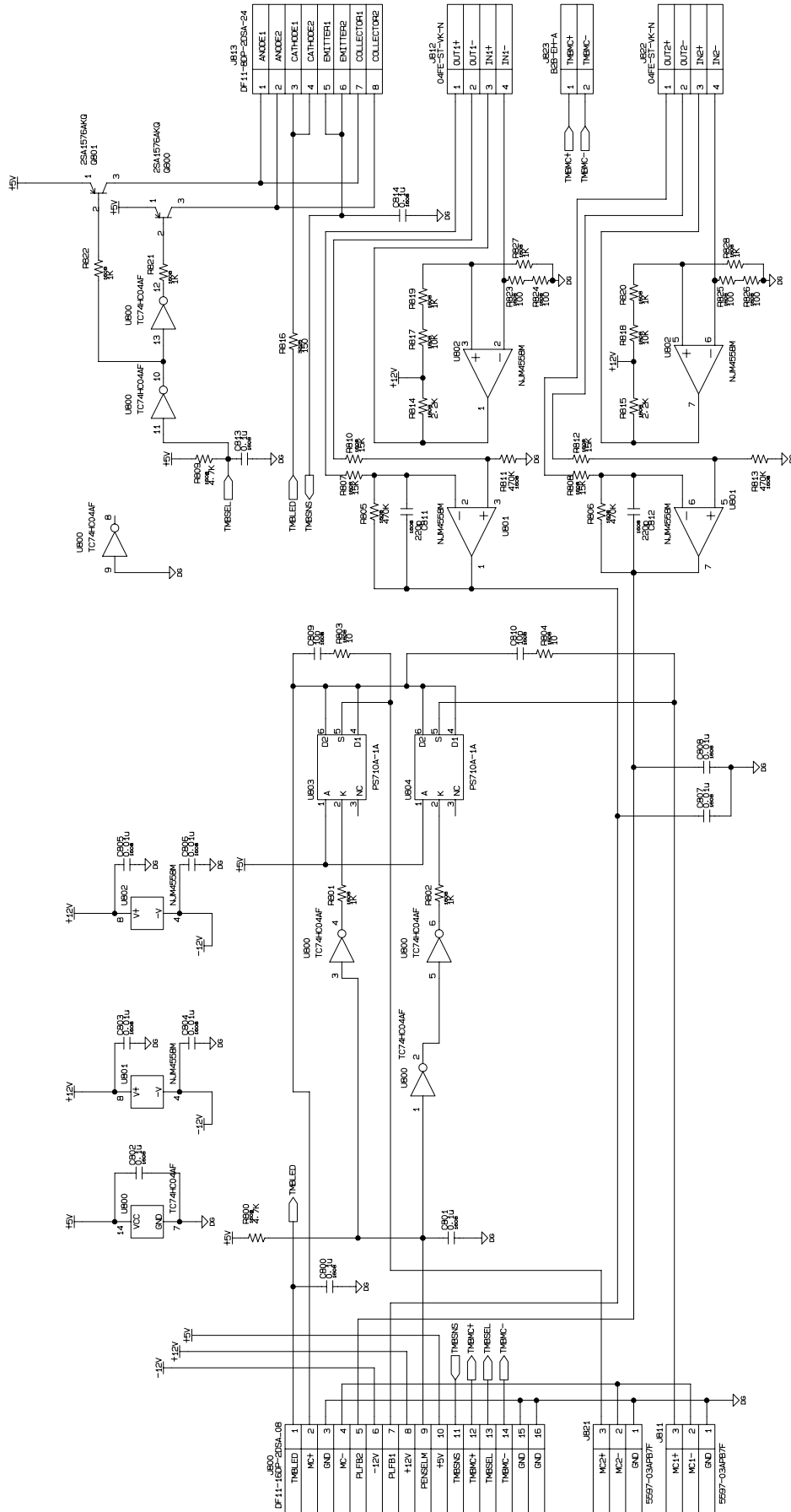
11.7 Pen Flex. Board (PN6121-05C)



11.8 Pen Flex. Board 1 (PN6121-06C)



11.9 2-Pen Board (PN6121-08C)

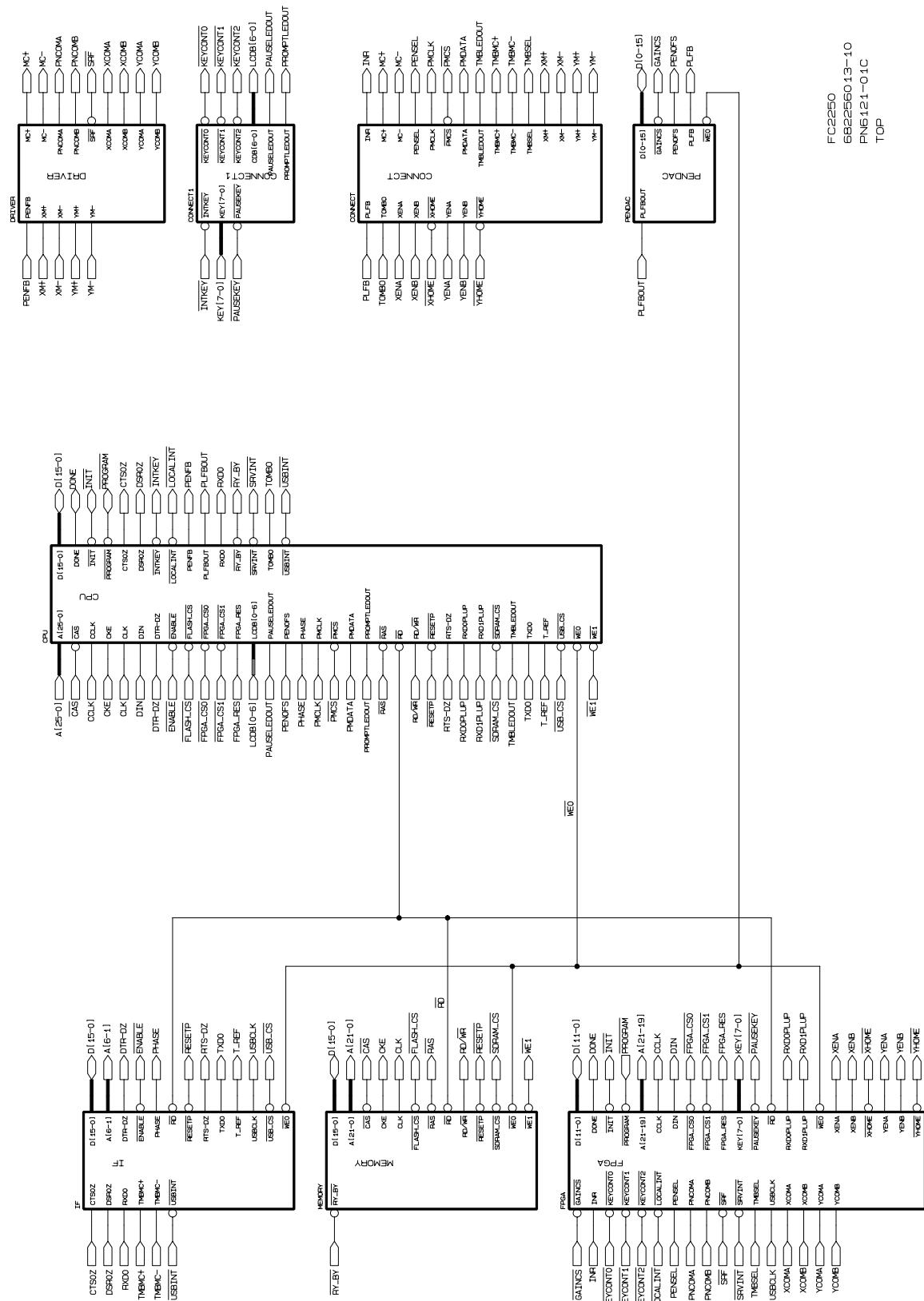


FC2250
6822506083-10
PN6121-08C
2PEN-BOARD



11.11 Main Board (PN6121-01C)

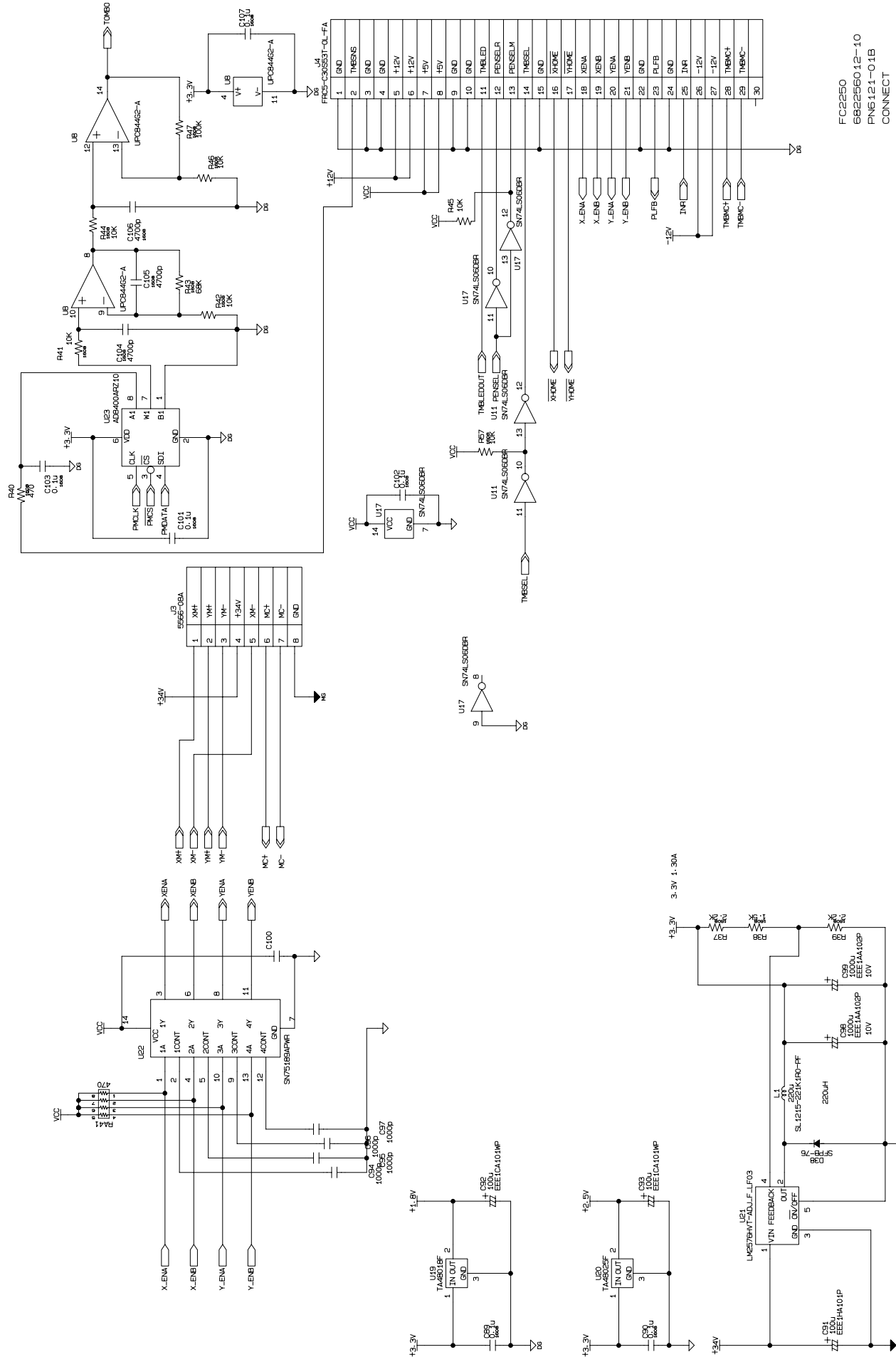
Main Board, Top



FC2250
682256013-10
PN6121-01C
TOP

11. BLOCK DIAGRAMS AND CIRCUIT DIAGRAMS

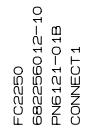
Main Board, Connect 1/2



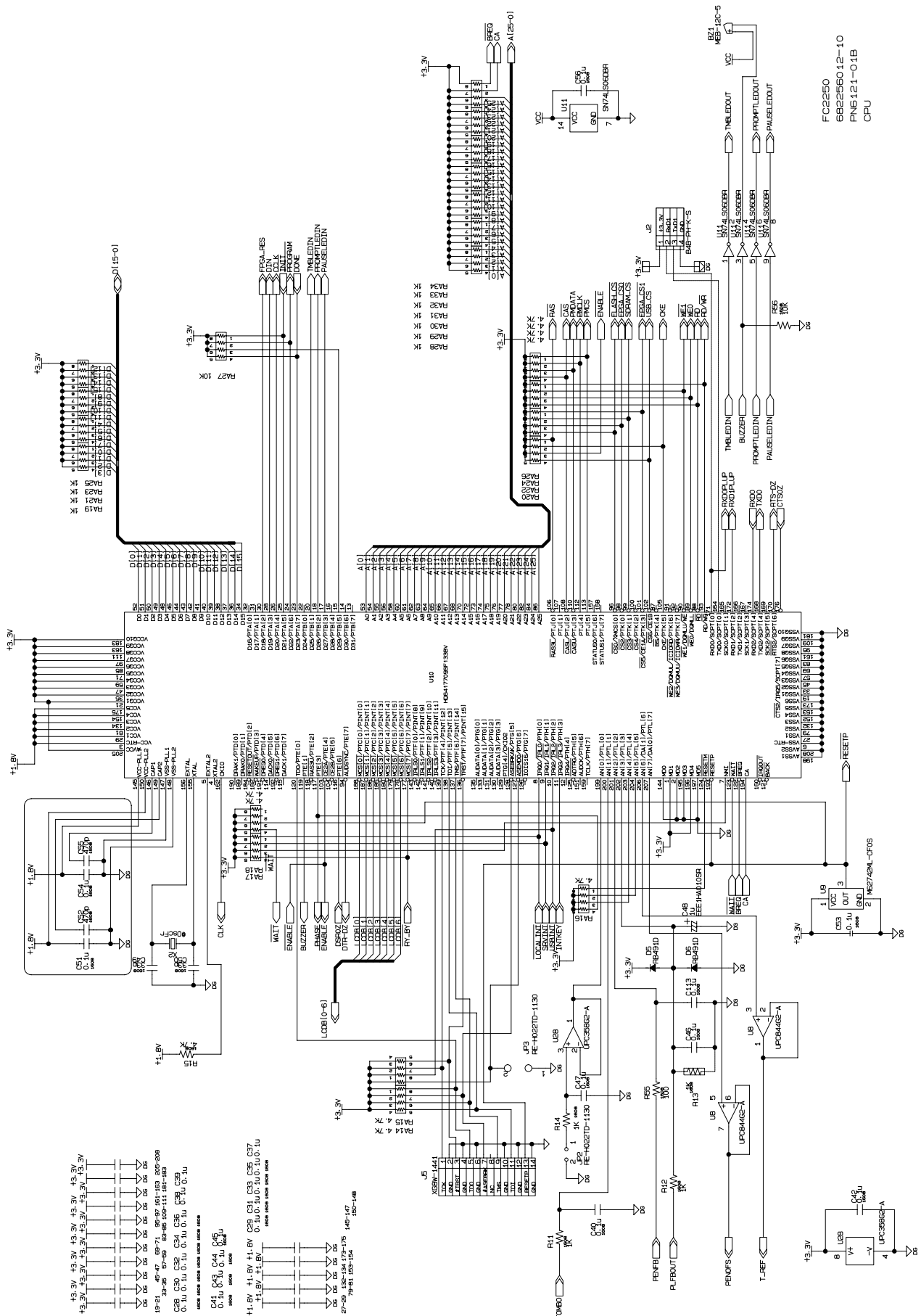
FC2250
682256012-10
PN6121-01B
CONNECT

11. BLOCK DIAGRAMS AND CIRCUIT DIAGRAMS

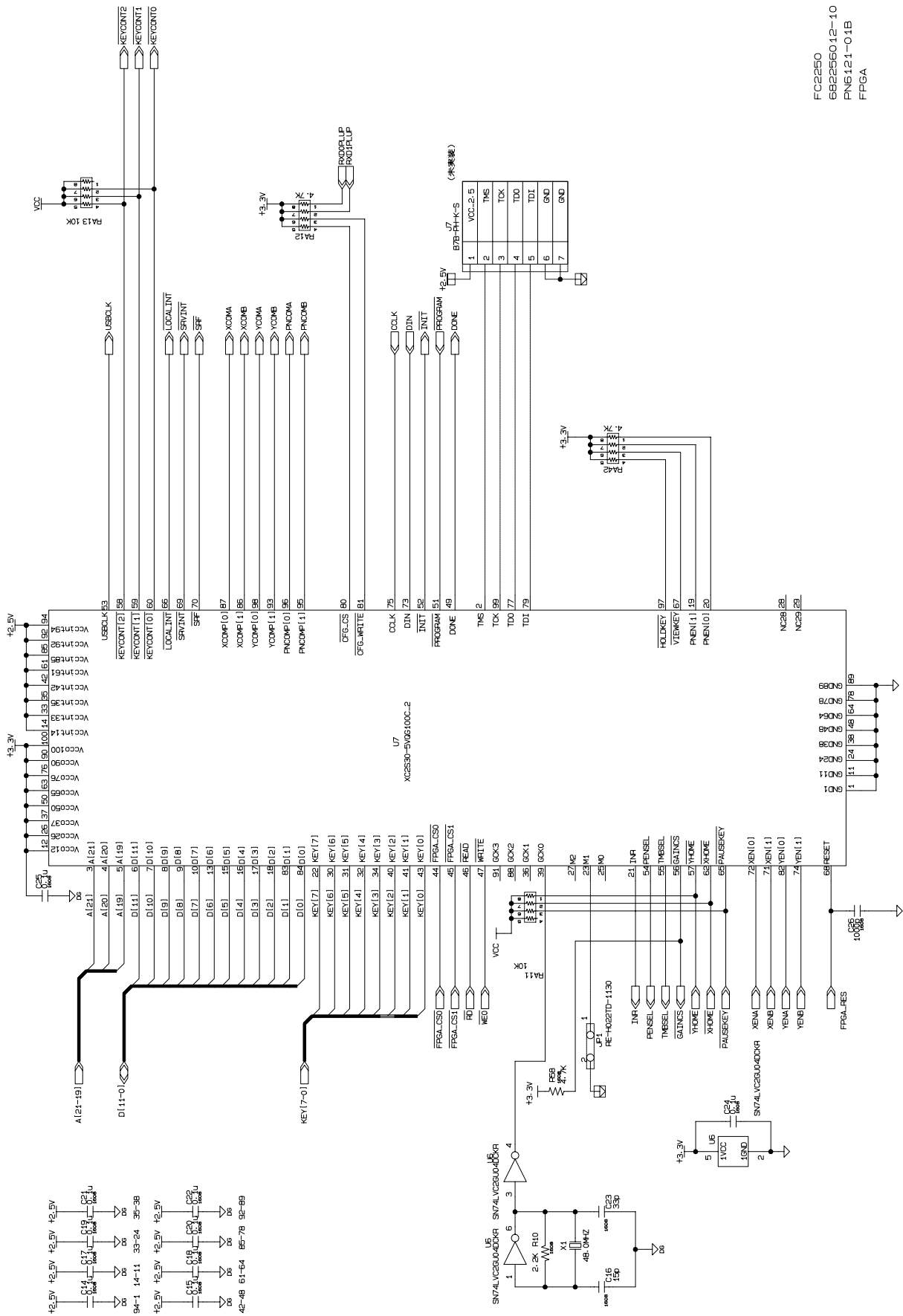
Main Board, Connect 2/2



Main Board, CPU

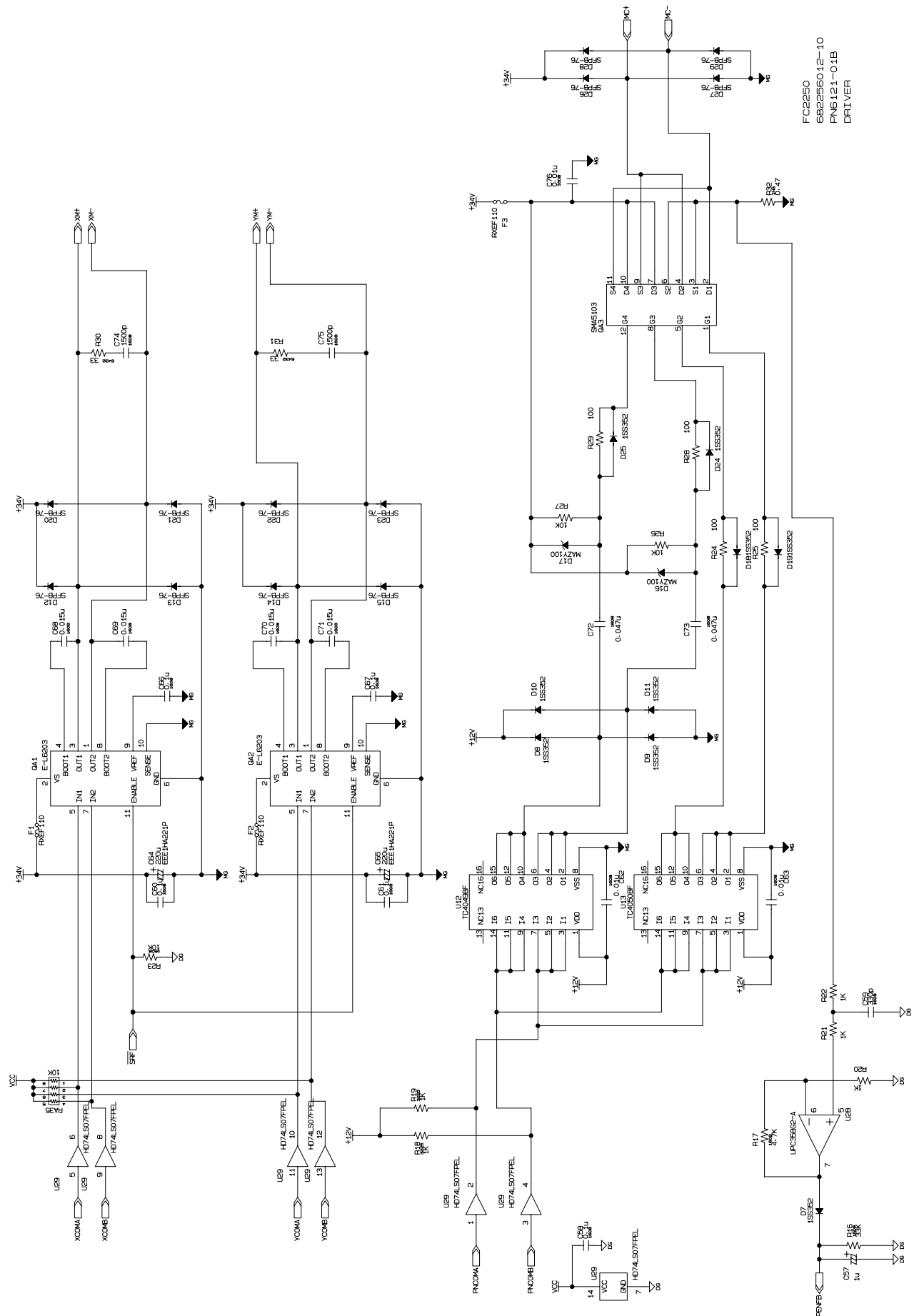


Main Board, FPGA

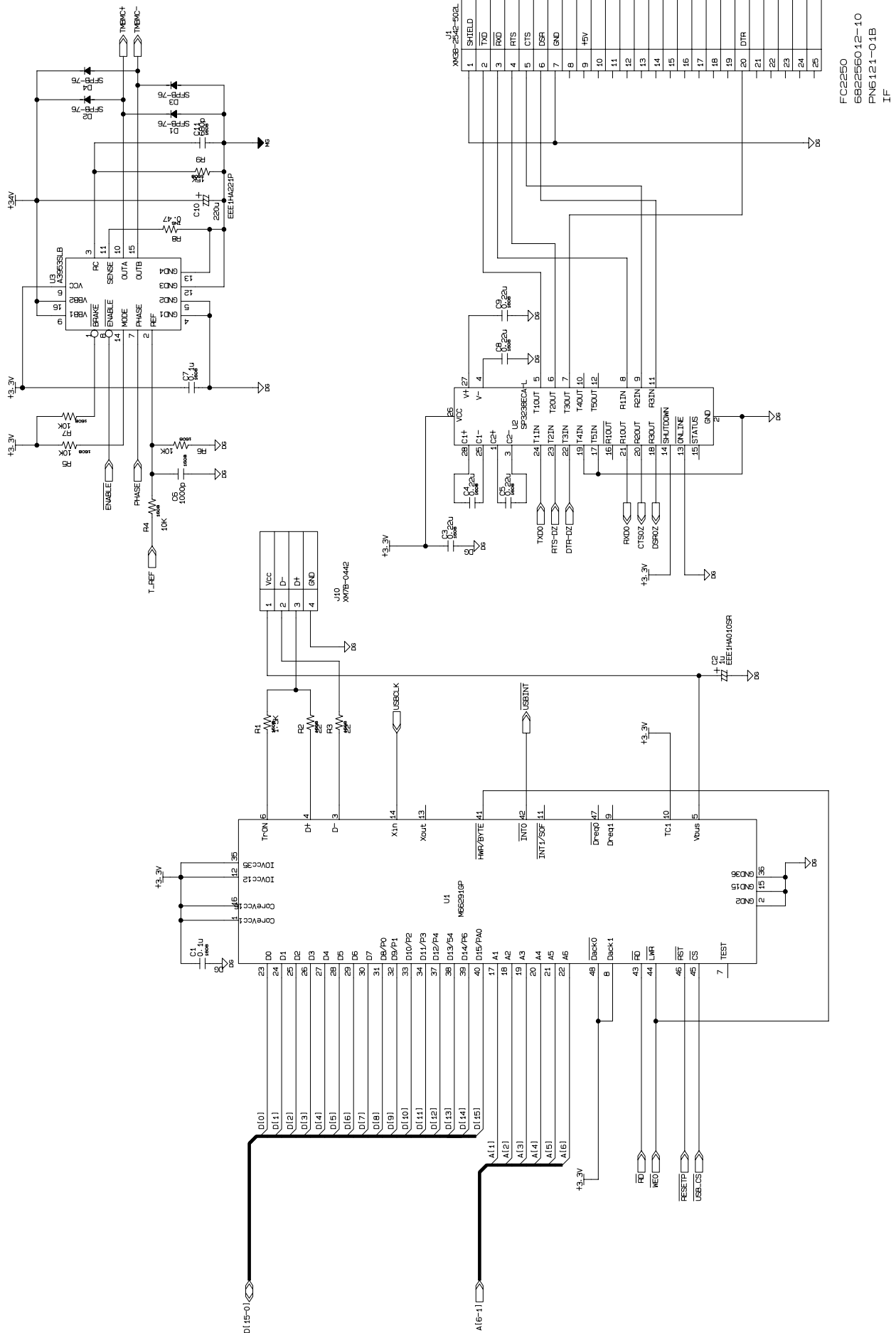


FC2250
582256012-10
PN6121-01B
FPGA

Main Board, Driver

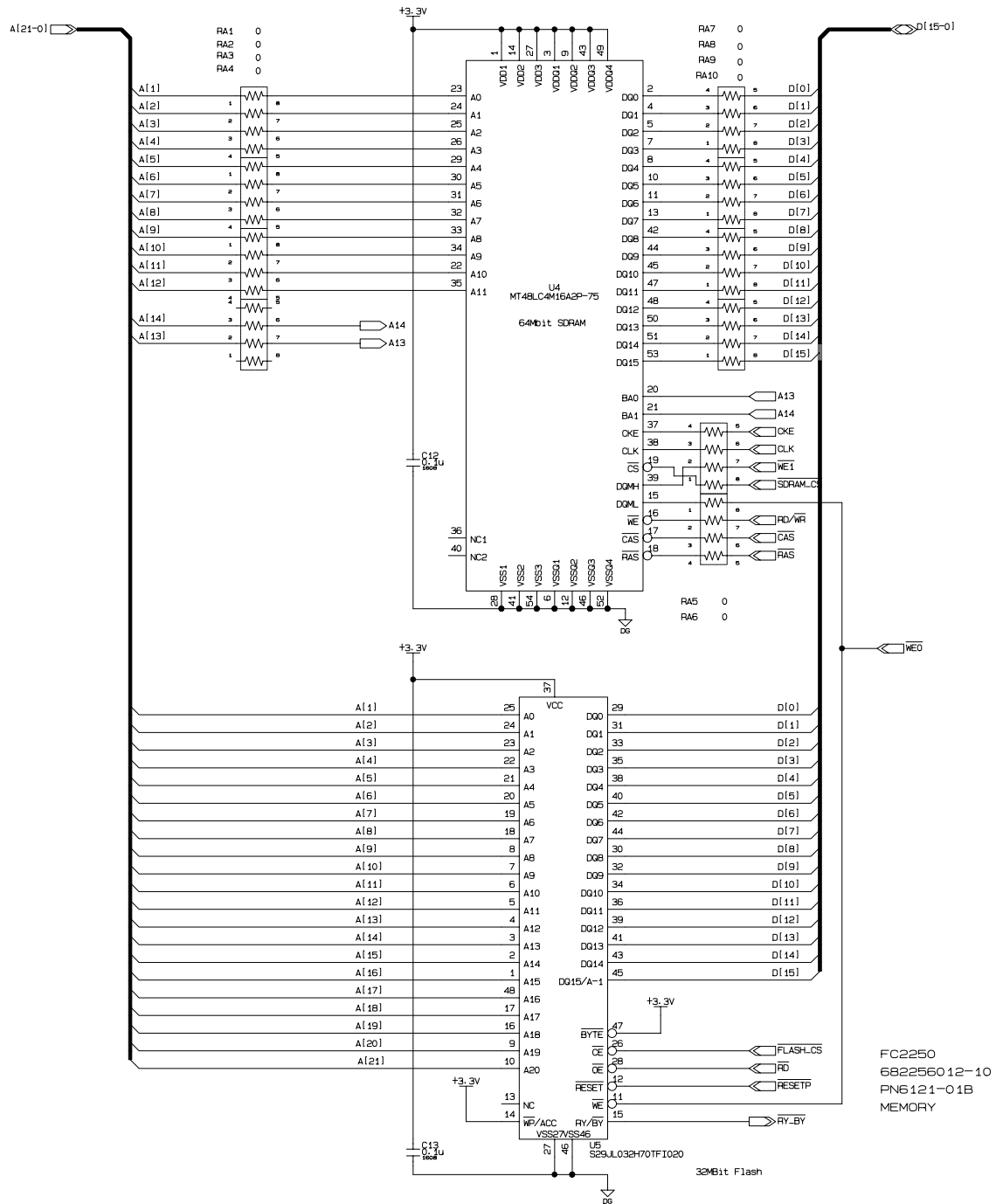


Main Board, IF

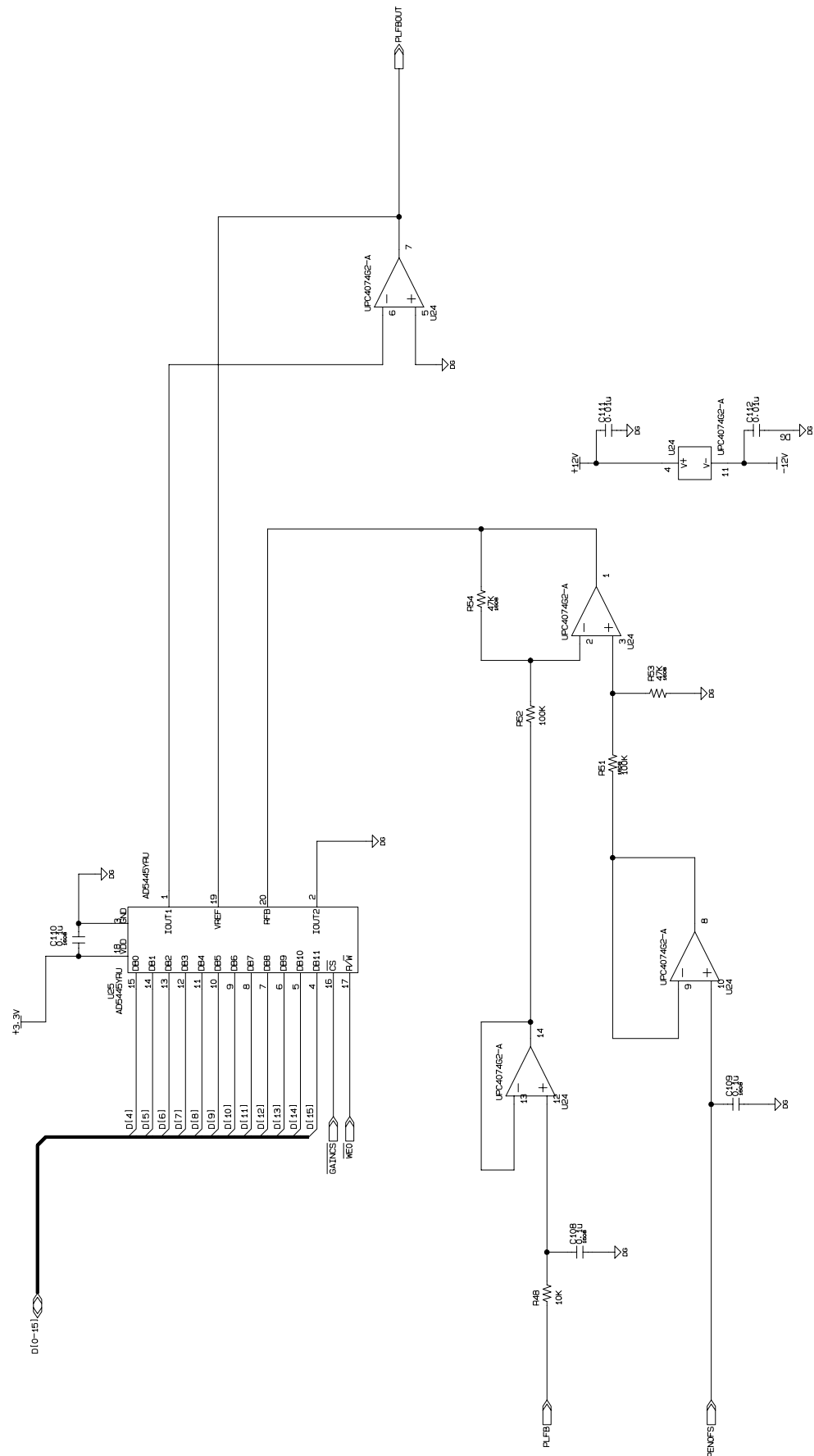


11. BLOCK DIAGRAMS AND CIRCUIT DIAGRAMS

Main Board, Memory



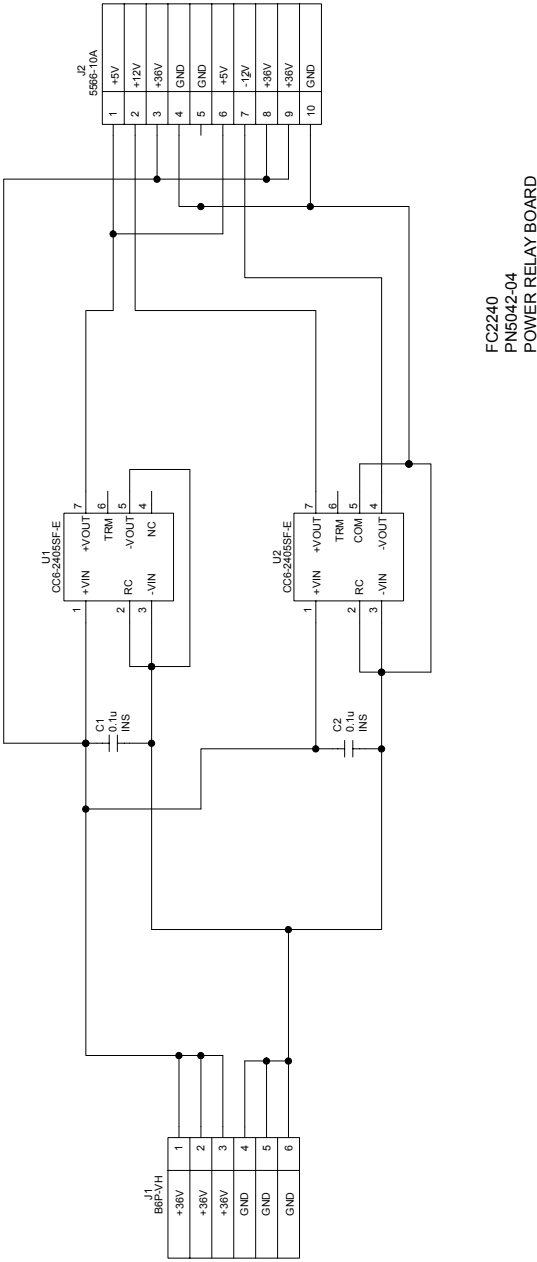
Main Board, Pen DAC



FC2250
682256012-10
PN6121-01B
PENDAC

11.12 Power Relay Board (PN5042-04)

Power Relay Board (PN5042-04)



11.13 Miscellaneous

792807030	Cable, X relay board to X home sensor	CA223303	1
	Cable, X relay board to X motor	CA2291-51	1
692247070	Cable, Power supply board to power supply relay board	CA504207	1
692247060	Cable, Power supply board to power switch	CA504206	1
692807142	Cable, Key relay board to LCD	CA2232112B	1
692807131	Cable, Key relay board to chart hold switch	CA2232113A	1
692236112	Cable, Main relay board to key relay board	CA2290-01B	1
692236133	Cable, Main relay board to X relay board	CA2290-03C	1
692247080	Cable, Main relay board to X flexible board	CA504208 (FC2250-60/120)	1
692247090	Cable, Main relay board to X flexible board	CA504209 (FC2250-180)	1
122927511	Cable, X flexible board to High voltage board	CA2292-51A (FC2250-180)	1
692236211	Cable, X flexible board to High voltage board	CA2292-41D (FC2250-60/120)	1
108901173	Cable, AC inlet to power switch	CA08917C	1
692236041	Cable, AC inlet to power switch	CA306004	1
692236051	Cable, AC inlet to power switch	CA306005	1
692256010	Cable, Main board to main relay board	CA612101	1
692256021	Cable, Main board to main relay board	CA612102A	1
692256031	Cable, Main board to main relay board	CA612103A	1
692256041	Cable, Main board to power supply board	CA612104A	1
692256051	Cable, 2 pen relay board to pen flexible board	CA612105A	1
110006060	Flexible Cable, 2 pen board to pen 1 moving coil	FPC10002	1
122936100	Flexible Cable, 2 pen board to hight sensor	FPC2293100	2
122936110	Flexible Cable, 2 pen board to pen 2 moving coils	FPC2293110	1
692256061	Cable, 2 pen board to ARM sensor	CA612106A	1
162291100	Y flexible Cable	FCA2291010	2
692256220	X flexible Cable	FPC612122 (FC2250-180)	1
692256230	X flexible Cable	FPC612123 (FC2250-60/120)	1
692807051	Cable, X-Y relay board to Y home sensor	CA2232503A	1
520100241	AC Cable	VM1182-1276.5M	
520100330	UL/CSAAC Cable	UL/CSA Code SJT	
500050024	CEE AC Cable	VM0306B-0304B2M	
520000022	BS AC Cable	GRCK-B0	
520100103	SUS AC Cable	PISEV-H05VV-F-1C	
520100098	SAA AC Cable	SAA Standard Cable Set 3M	
520000005	BS AC Cable (P)	Z-VCTF-OR-BS	